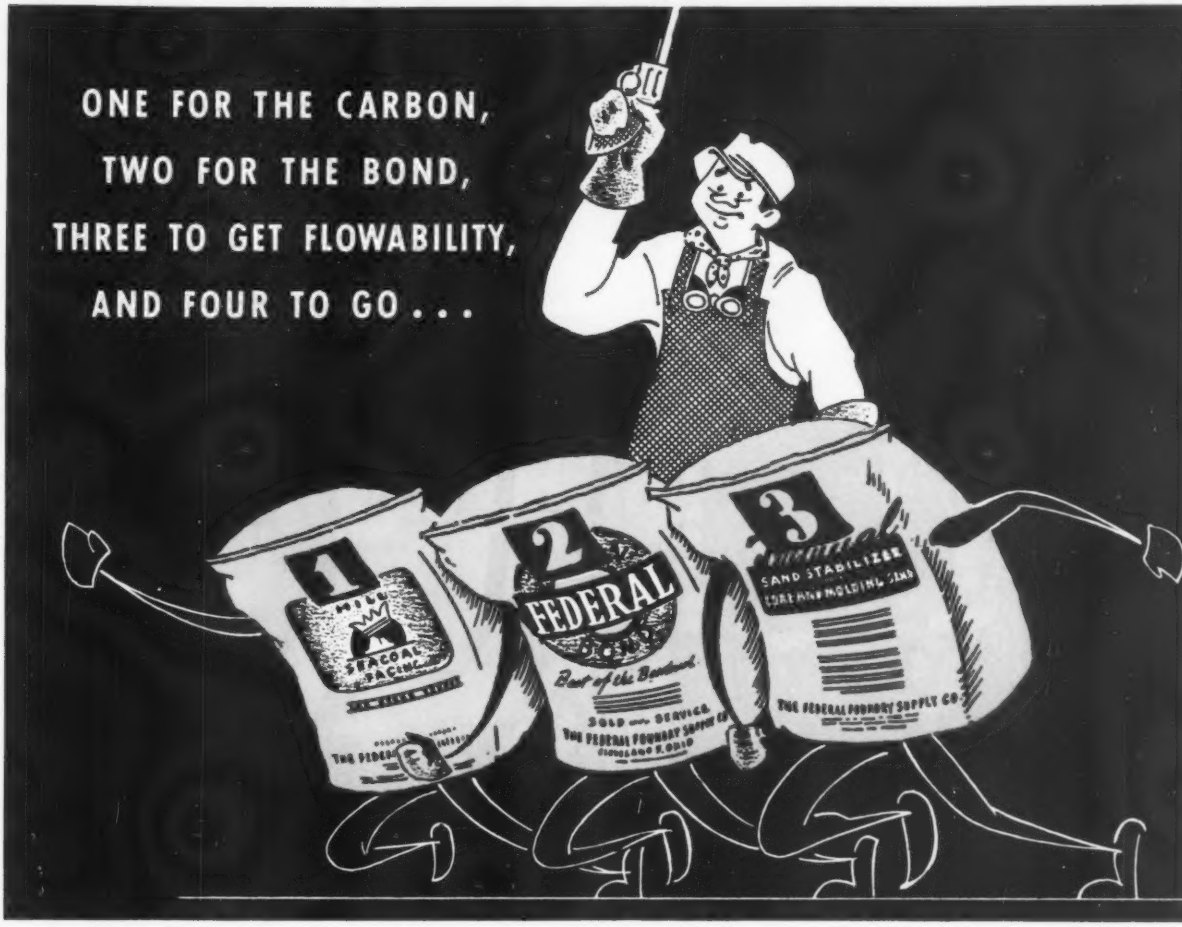
The Foundrymen's Own Magazine

American Foundryman

SEPTEMBER

1954

New 2-ton-per-hour Lectromelt Furnace in the steel foundry of Worthington Corporation, Harrison, N. J.



. . . FOR BETTER SAND PREPARATION!

When it comes to preparing molding sand—there's no better way, no easier way, no more dependable way—than the Federal way! By simply adding Federal Crown Hill Seacoal, Federal Green Bond Bentonite (pulverized or granular) and Federal Sand Stabilizer to your sand in varying amounts, all the important sand characteristics can be closely controlled and easily changed to satisfy specific requirements. You get *extra* advantages, too—lower cost, more uniform mold hardness, better shakeout, better finish and more readily saleable castings. Plus this mighty important fact—the three additives will cost you *less than $1.00 per ton of castings produced!*

There's a new Federal bulletin on the preparation of molding sand, that hundreds of foundrymen have found extremely helpful. A copy is yours for the asking. Write for it today!

IMPORTANT

FOR SLURRY USERS!

If you use the slurry system of sand bonding, you'll want to learn about Federal's #1200 Slurry Grade, Granulated Green Bond Bentonite . . . and how it's used with Crown Hill Seacoal and Federal Sand Stabilizer to make the perfect slurry. We'll gladly consult with you or send complete information.

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Make your foundry a better place in which to work!

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American Foundryman

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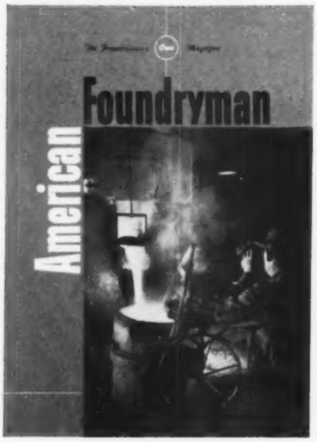

Checking spout temperature of iron with optical pyrometer at Zenith Foundry Co., Milwaukee.

In This Issue . . .

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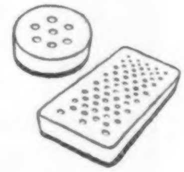
Facts you should know about

LOUTHAN REFRACTORY STRAINER CORES

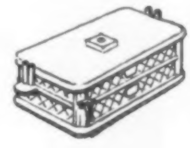
The product

Louthan perfected and made the *first* successful refractory strainer cores. While marketed up to now by Harbison-Walker, all have been *made by Louthan*, a former subsidiary of "H-W". All Louthan Cores are made of a high-strength ceramic material having a low thermal expansion. All are precision formed and kiln fired. All are *guaranteed* to withstand pouring temperatures up to 3,000° F. without spalling or eroding—a great help in producing better, cleaner castings at lower costs.



Its uses and advantages

Used by leading foundries in the making of *nearly ten million* castings last year, Louthan Refractory Strainer Cores pay for themselves many times over. Easily inserted in the drag, they closely control the flow of metal, keep slag and sand-core inclusions out of castings, save needless grinding and rejects, permit users to work to closer tolerances, often eliminate the need of costly gating systems.



Performance standards; sizes and shapes

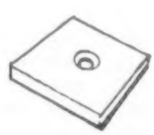
High in thermal shock resistance (*will withstand immersion in 3,000 degree molten steel for 25 seconds without spalling or disintegrating*). Louthan Cores are exceptionally uniform, dimensionally accurate, no flash in openings, easy to handle and use. Available in seven standard sizes (ranging from 1¾″ to 3½″ in diameter), also in special sizes and shapes to meet your specific requirements.

Sales representation

Louthan Strainer Cores will be distributed and sold by leading *foundry supply houses* exclusively. Their knowledge of your business should be helpful in your making the best use of these refractory strainer cores. These jobbers will also carry stocks for your added convenience.

Louthan Refractory Breaker Cores

A joint development of Louthan, H-W and the Steel Founders Society, these breaker core shapes are saving time and money for a growing number of steel casting producers. Scientifically designed for just the right amount of heat conductivity needed for perfect castings. Available in a wide range of sizes.



TEST LOUTHAN CORES IN YOUR OWN FOUNDRY!

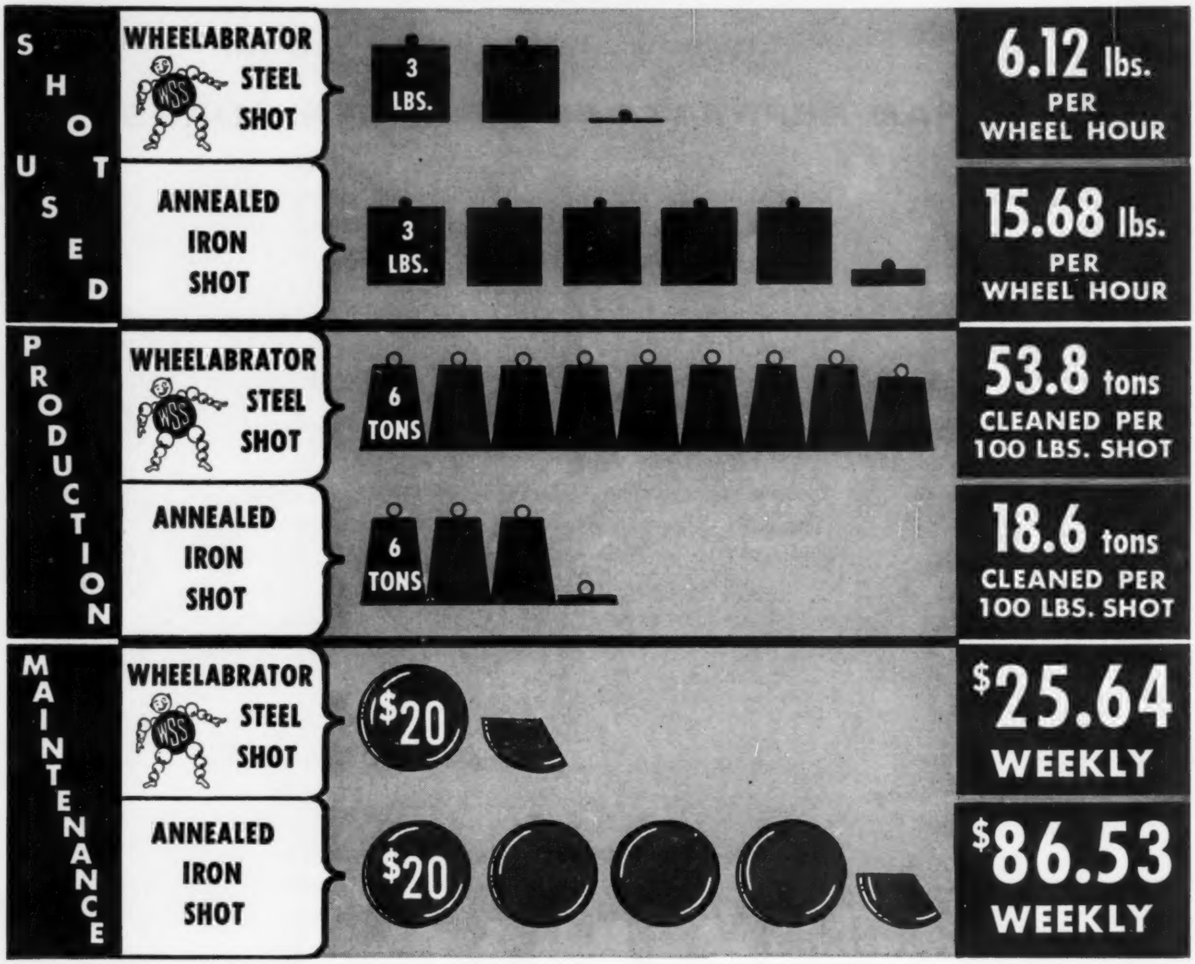
See your nearest Jobber or write us for free samples!

FERRO

THE LOUTHAN MFG. CO.

(Subsidiary of Ferro Corporation) East Liverpool, Ohio

pioneering developments keep WHEELABRATOR® STEEL SHOT first in abrasives



How Gunite Foundries Corp. Saves

with Wheelabrator Steel Shot

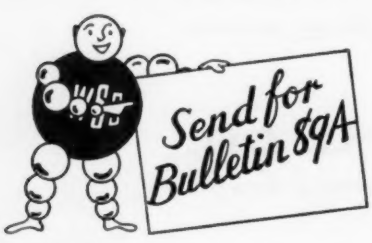
Gunite Foundries Corp., Rockford, Illinois wisely switched to Wheelabrator Steel Shot for cleaning semi-steel castings in their Wheelabrator blast cleaning machine. They discovered this superior electric furnace steel shot came out on top on every count compared to the annealed iron shot previously used. As illustrated in the chart above, important savings were realized in abrasive consumption, increased production and decreased maintenance. In addition, Gunite found a noticeable improvement in the cleanliness and surface appearance of their castings.

Every day more and more foundries of every type are switching to Wheelabrator Steel Shot. The reason is obvious: Performance records in these plants prove convincingly that the lowest overall cleaning costs are achieved with Wheelabrator Steel Shot.

Combining hardness with toughness, this superior shot will clean or peen faster, at lower costs, than any other abrasive. Try it and prove it for yourself.

PLUS

50 lb. Cartons and Palletizing. A Scheduled Delivery Plan.



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630 S. Byrkit St., Mishawaka, Indiana

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fine FANNER Twisted GAGGERS
GREATER GRIP-ABILITY
. . . twisted gaggers have been proven to have more gripping ability than any other shape at a comparable cost
ALL NEW MATERIAL
. . . not re-rolled scrap. Can be re-used many times reducing unit cost.
AVAILABLE IN ALL SIZES
. . . Fanner gaggers are available in sizes 3/8", 7/16" and 1/2" in any dimensions, single or double bend.
designed to insure
BETTER
FIRMER
molds . . .
Fine FANNER gaggers are scientifically engineered to afford maximum mechanical grip and greatest bonding area per given cross section. The twisted stock permits a uniform grip all along the bar surface, allowing sand to pack evenly and firmly around each gagger and to hold the mold securely. FANNER gaggers are easily formed, straightened and re-formed and cost less than it would cost to make your own. Write for samples and prices today.
The FANNER MANUFACTURING COMPANY
Designers and Manufacturers of Fine Fanner Chaplets and Chills
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Save 5 ways with pallet boxed shipments

VANCORAM BRAND

FERROCHROMIUM, FERROSILICON, FERROMANGANESE BRIQUETTES

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You can save time and money through...

1. EASIER HANDLING—Pallet boxes for Vancoram Briquettes and ferro alloys have been especially designed for safe, easy handling. Constructed of sturdy hard wood and tied with strong steel strapping—the chance of breakage is minimized.

2. MORE EFFICIENT STORAGE—The design and strength of Vancoram Pallet boxes permit safe multiple stacking indoors or out, which may not be feasible with more flimsy construction.

3. READY IDENTIFICATION — Pallet boxes of Vancoram Briquettes and ferro alloys are easily identified by the same plain marking and color-coding identification labels used on Vancoram Drums.

4. LESS CHANCE OF CONTAMINATION—Material confined to its own container rather than unwieldly bulk handling.

5. FASTER INVENTORY— Has the advantages of packed shipment in easy, quick inventory.

Besides briquettes, most other Vancoram ferro alloys are available in economical, easily-handled pallet boxes — another Vancoram service to you.

Producers of alloys VANCORAM metals and chemicals

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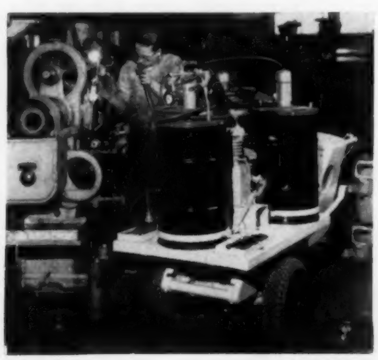
Products & Processes

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

▲ Mix-Mullers

Two new models in the line of Simpson Mix-Mullers for preparing foundry sand have been announced. Said to offer increased capacity and reductions in discharge time, the new No. 1 Model F and No. 1½ Model F Mix-Mullers are rated at 500 and 1000 lb batch capacity respectively. New features include: integral liquid additions funnel and crib scraper; V-Belt drive, improved lubrication access and spring loaded mullers for infinitely variable muller adjustments. *National Engineering Co.*

For more data, circle No. 437 on p. 17



▲ Mobile Service Unit

Small, self-powered, self-propelled service station for maintenance of heavy equipment has been introduced. Mobile unit is powered by a 6 hp Wisconsin Engine, equipped with either rope starting or electric starting. Entire unit, including compressor, air tank, space for three 100 lb drums, tool trays, service hoses, and lubricant pumps is only 31 in. wide, making it easy for the lubrication man to take the unit between machinery and close to equipment to be serviced. *Prime-Mover Co.*

For more data, circle No. 438 on p. 17

▼ LPG-Powered Trucks

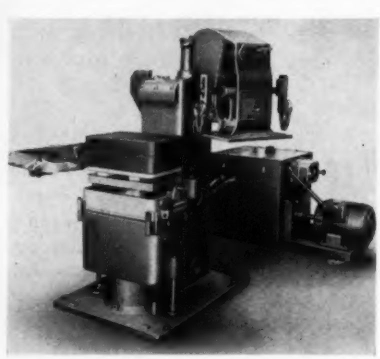
First approval and listing for a fork-lift truck powered by liquefied petroleum gas (LPG) has been granted by Underwriters' Laboratories. LPG-Car-loader is a standard model fork truck in 5000 lb capacity, equipped with conventional, Dynatork or Hydratork transmission, factory-modified for LPG operation. Installation of a compact, field-tested "Fuel unit" and relatively minor engine changes adapt the gasoline-powered fork truck for LPG. *Clark Equipment Co.*

For more data, circle No. 439 on p. 17

▼ Boxless Molding Machine

The SP-3210 Hydroil-Electric Boxless Molding Machine produces molds for light, shallow castings at great speed, entirely without molding boxes, snap or slip flasks. Machine incorporates permanent aluminum top, and cast iron bottom "boxes". Double faced pattern or match plates must be used, as cope and drag are rammed simultaneously. A supply of bottom boards only is required. Pressure of 60 psi on the mold gives a high hardness figure. Bulletin No. SP-3210 describes unit. *Sutter Products Co.*

For more data, circle No. 440 on p. 17



▲ Radioactive Isotopes

A system of using radioactive isotopes in industry has been developed to peer into dense materials with the new Gamma Rays Machine. Unit reveals metals' and other dense materials' hidden secrets, enables manufacturers to spot imperfections. Machine can penetrate steel plate up to eight in. in thickness—is a completely portable unit utilizing radioactive isotopes to produce X-Ray-type pictures of heavy industrial products. *Gamma Industries, Inc.*

For more data, circle No. 441 on p. 17

▲ End Dump Trucks

Klaas-built end dump trucks eliminates the back-breaking effort of tipping the hopper. It is easy to dump the contents of the filled hopper by releasing a simple lock. Likewise, after discharging, it requires practically no effort to return to original position. Trucks can be made in a variety of capacities without impairing the dump-return facility. They come with wheels or pallet-type skid base for use with fork lift trucks. *The Klaas Machine & Mfg. Co.*

For more data, circle No. 442 on p. 17

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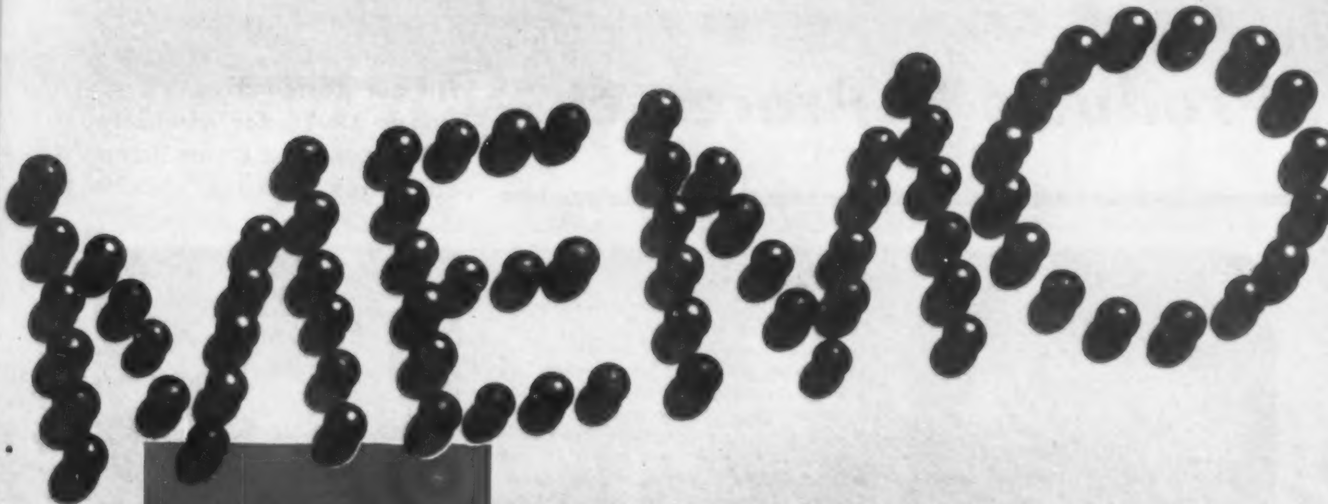
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Products & Processes

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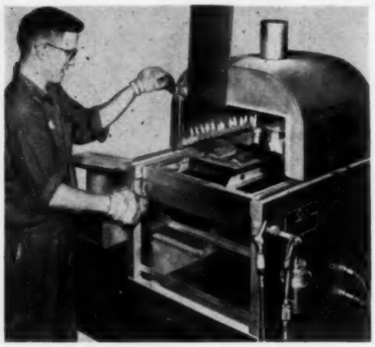
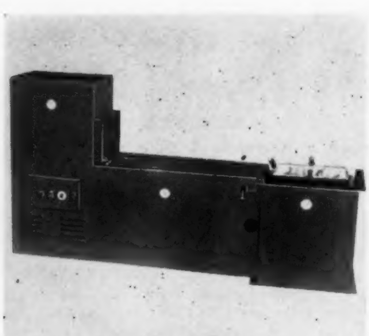


▲ Shell Mold Machine

GEE Shell Mold and Core Making Machines are designed to use any metal pattern which will not disintegrate at the desired operating temperature. Another outstanding feature claimed is that it will make shells and cores simultaneously when necessary, as long as the patterns and core boxes will fit under the dump box. Shell size is controlled to the exact size of the mold. Another advantage is that the operator can repair visible shell defects while they are on the machine. *Metco Processing Corp. and Gladwin Corp.*

For more data, circle No. 443 on p. 17



▲ Pneudraulic Mold Machine

Pneudraulic Model 12x18 Shell Molding Machine makes shell molds for producing castings of great accuracy and fine surface finish. Production rates of 45 to 60 shells per hour can be maintained, it is claimed. Radiant Oven is used to heat the pattern as well as cure the shells. Dump box which is used for investing the pattern has several interesting features. A breaker screen is provided to insure even distribution of the sand-resin mix regardless of the quantity of mix. *Centrifugal Casting Machine Co.*

For more data, circle No. 444 on p. 17

▼ Utility Hoist

New electrically powered, hydraulic "Utility" hoist permits one man to lift up to 2000 lb in less than half a minute simply by pressing a button. Manufacturer claims it lifts loads twice as fast as a manually powered hoist or crane. In addition, this all-purpose hoist serves double-duty, as it is quickly changeable from a mobile shop hoist to a truck bed or loading dock mounting. Six-volt motor is battery powered. Conversion kits for manually operated "Utility" Hoists are available. *Unit Mfg. Co.*

For more data, circle No. 445 on p. 17

▼ Hardness Testing

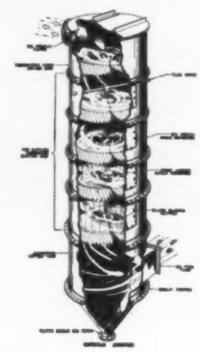
Reflex machines for Vickers, Knoop, Grodzinski, Brinell and (optional) Rockwell tests feature unusual test load capacities (from 1 to 250 kg), push-button load selection, and automatic projection. All weight blocks remain permanently in the machine. Operator simply presses the push button for the particular testload desired. Magnification up to 140 times permits precise measurement. Full information is contained in Bulletins No. DIA-2, and "Micro-Reflex." *Gries Industries, Inc.*

For more data, circle No. 446 on p. 17

▲ Radiant Heater

New heater called Down-Beam, employing the principal of infra-red or radiant heating, is designed for overhead installation and makes localized comfort practical and economical in large, unheated mill and factory buildings. Installed over a production bench it keeps workers, tools and work at a comfortable temperature. Heater involves only a small gas burner playing into a suspended bed of alloy steel wool. Metal wool remains incandescent from the instant the gas is ignited until turned off. *Union Chill Mat Co.*

For more data, circle No. 447 on p. 17



▲ Dust Collector

Development of the CW-1 centrifugal wet dust collector for those dust control problems which cannot be solved by the use of cloth type collectors has been announced. Problems include: high temperature or moisture; explosive or combustible dusts; corrosive, highly abrasive and/or obnoxious dusts; or combinations of the foregoing. Type CW-1 collector is of counter-current design (air flow counter current to water flow) and of tower type construction. *Pangborn Corp.*

For more data, circle No. 448 on p. 17

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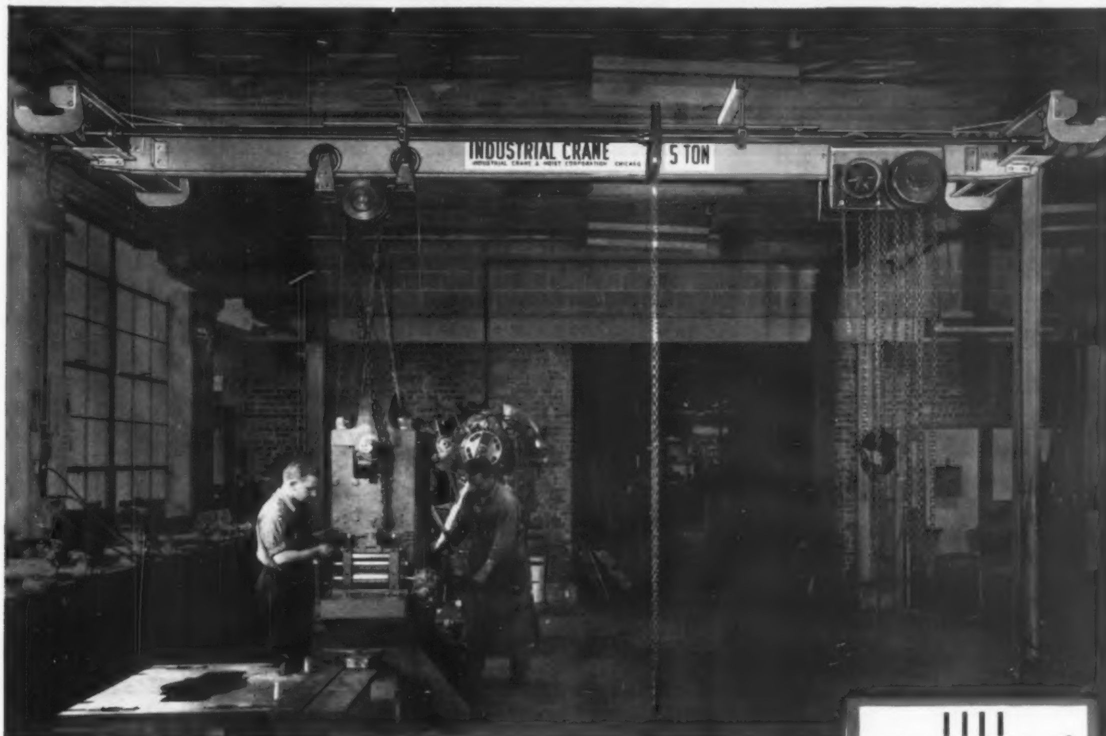
USE *Industrial* HAND GEARED CRANES FOR **GREATER ECONOMY**



The Industrial Hand-Geared Crane facilitates assembly of this heavy punch press by accurately spotting the component parts to line up bolt holes.
Courtesy of Di Machine Corp., Chicago, makers of Diebel High Production Presses.

Industrial CRANES

When machinery or heavy loads are to be moved and where accurate spotting of these loads is a necessity Industrial Cranes do an outstanding job. These ruggedly built smooth operating cranes are ideal where runways are short and the production cycle is not too rapid.*

*Industrial Motor-Driven Cranes are recommended where high production rates must be maintained or runways are long.

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Products & Processes

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Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

Pattern Coating

New pattern coating, called Master Kincote has been marketed for use in providing maximum protection for patterns. It is said to offer more resistance to abrasion, moisture, core oils, kerosene, gasoline, synthetic binders, and the like. *Kindt-Collins Co.*

For more data, circle No. 449 on card

Porosity Testing

Magnus NZL, a wetting agent, is based primarily on Magnus NZ, one of the effective concentrated wetting agents available today, but also contains a sudsing agent which causes the solution to bubble profusely when used in water-testing of castings. *Magnus Chemical Co.*

For more data, circle No. 455 on card

Grinding Wheel

New vitrified grinding wheel for foundry use at speeds up to 6500 sfpm has been announced. Known as the "K" Bond snagging wheel, it gives up to 30 per cent longer life. It was designed for Crystolon silicon carbide wheels in rough grinding cast iron. *Norton Co.*

For more data, circle No. 457 on card

Hearing Protector

Lee Sonic Ear-Valv is a mechanical hearing protector containing a tiny precision-built mechanism which acts to take the shock and harm out of loud noise while permitting conversation and normal air circulation. *Sigma Engineering Co.*

For more data, circle No. 450 on card

Pneumatic Vibrators

Small Vibron vibrators reduce processing time by vibrating light-walled sheet metal or wood bins, hoppers, chutes, and screens to prevent arching, clogging or sticking of inert bulk materials. Helps eliminate air pockets in forms. *Vibron Div., Burgess-Sterbentz Corp.*

For more data, circle No. 456 on card

Refractory Cement

Laboratory development of a refined refractory cement claimed impervious to penetration by molten aluminum has been announced. Exhaustive tests indicate the new cement can be used to line loop-type induction furnaces. *Electro Refractories & Abrasives Corp.*

For more data, circle No. 458 on card

Pattern Letters

New "Cantonian" style pattern letter for foundry use was developed to overcome the often-present problem of poor draws from the sand, caused by the sharp corners. Round corners of this new type permit a smooth, clean draw from the sand. *Canton Products.*

For more data, circle No. 451 on card

Ionizing Iron

Reecemelt is a patented method of making iron for castings that make it possible to know exactly what the physical properties of the finished casting will be at the time the cupola is charged. No attendant technician is necessary. *Reecemelt.*

For more data, circle No. 452 on card

Fume Purifiers

OCM Catalytic Exhausts for removing harmful exhaust fumes from internal combustion engines in both industrial and commercial equipment are now available. Folder is available which illustrates the compact catalytic units. *Oxy-Catalyst, Inc.*

For more data, circle No. 453 on card

Master Aluminum Alloy

Availability of two new master alloy aluminum pig products, designated at 2364 and 2393, at regular pig prices has been announced. Alloys will provide a more uniform analysis by blending with secondary metals. *Reynolds Metal Co.*

For more data, circle No. 454 on card

Reader Service Dept.

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Please send me detailed information on the Products and Processes.

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Measuring Temperatures

Booklet, "How Temperatures are Measured," by Dr. G. M. Wolten, covers: heat and temperature as separate concepts; history of the commonly used scales for measuring temperatures; physical effects associated with a rise in temperature, and monitoring surface temperatures. *Tempil® Corp.*

For more data, circle No. 459 on card

Vacuum Furnaces

Bulletin No. 790 describes the growing use of vacuum furnaces. Applications of vacuum furnaces in melting and casting titanium, zirconium, germanium and similar rare metals, as well as sintering and annealing are described. *F. J. Stokes Machine Co.*

For more data, circle No. 461 on card

Aluminum Base Alloy

Properties of Ternalloy, aluminum base alloy series for high-strength castings without heat treatment, are available in a new file-folder brochure. Included is complete engineering information on the alloy series' mechanical and physical properties. *Apex Smelting Co.*

For more data, circle No. 463 on card

Chain and Slings

Bulletin C outlines types and uses of wrought iron chain and slings. Gives complete data on sizes, specifications, link dimensions, standard finishes and other pertinent information on specific grades of fire welded wrought iron chains. *The McKay Co.*

For more data, circle No. 460 on card

Electric Fork Trucks

"Electri-Facts," new 16-page brochure presents a thorough exploration of the electric fork truck. Construction features of the machine are interpreted through the use of schematic drawings. Three separate brakes are also described. *Clark Equipment Co.*

For more data, circle No. 462 on card

Coated Abrasives

"Coated Abrasives," a handbook and digest of coated abrasive technology, written by E. B. Gallaher, M.E., D. Eng., was originally issued in 1945 and has now been completely revised to keep pace with a fast-moving industry. *Clover Mfg. Company.*

For more data, circle No. 464 on card

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Foundry Shakeouts

New booklet, No. 124 C, describing Hewitt-Robins line of Floatex foundry shakeouts and allied foundry equipment is ready for distribution. Amply illustrated, the bulletin provides full technical details and dimensions. *Hewitt-Robins, Inc.*

For more data, circle No. 465 on card

Pressed Steel Flasks

Equipment Catalog No. 452, gives illustrations and construction details on light duty, medium duty, heavy duty and extra heavy duty flasks. Trunnions and clamps are diagrammed and illustrated. *Industrial & Foundry Sales, Inc.*

For more data, circle No. 466 on card

Motorized Reducers

Bulletin 3100 consolidates under one cover the selection tables, dimensions, weights, overhung load ratings, and thrust capacity ratings needed to select horizontal, vertical, or right angle Falk Motoreducers in either the All-Motor or Integral design. *Falk Corp.*

For more data, circle No. 467 on card

Ductile Cast Iron

Bulletin DI-1, 12 pages with illustrations, graphs and charts, describes a recently developed family of irons which possesses the process advantages of cast iron and which has engineering properties that approach those of cast steel. *International Nickel Co.*

For more data, circle No. 468 on card

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Free Foundry Information

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Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

Dust Control

Bulletin No. 3 discusses cupola dust control systems. Included are technical discussions and drawings of a variety of cupola dust control systems. A simplified and economical approach to the problem of collecting cupola dust "dry" is presented. *Mechanical Industries, Inc.*

Fo rmore data, circle No. 469 on p. 18

Solenoid Valves

Bulletin M-500 covers design and performance characteristics of the diaphragm operated solenoid valves. Photographs, line drawings, specifications and tables are included. Cross section views show valve's only two moving parts. *Eclipse Fuel Engineering Co.*

For more data, circle No. 470 on p. 18

Grinding Wheels

Catalog 1748 describes reinforced resinoid line of grinding wheels. Liberally illustrated booklet contains typical application photographs, tables of wheel sizes, prices, operating speeds and other data. Scores of portable grinding operations are listed. *Norton Co.*

For more data, circle No. 471 on p. 18

Cupola Operation

Bulletin No. FO-1 offers suggestions for improving cupola operation. Discussed are the mechanized handling of raw materials, lining the cupola, getting a good "first" tap, improving blast control, checking tuyere height, and mechanical charging methods. *Whiting Corp.*

For more data, circle No. 472 on p. 18

Speed Controller

Yale Magnetic Cam-O-Tactor, a speed controller designed to fit all makes of electric trucks, is described in bulletin No. 1599. Illustrated brochure shows the method of operation of the unit. Basically, it is a magnetic contractor unit. *Yale & Towne Mfg. Co.*

For more data, circle No. 473 on p. 18

Waste Water

Bulletin No. F2034C discusses foundry water clarification combining chemical flocculation, sedimentation, and solids concentration. Brochure contains questions and answers about an entirely new water treatment process. *Eimco Corp.*

For more data, circle No. 474 on p. 18

Automatic Spectrophotometry

Reprint R-58, "A New Advancement in Automatic Spectrophotometry" by Lee Cahn and George Gale, covers a talk presented before the Symposium on Molecular Structure and Spectroscopy at Ohio State University, Columbus, Ohio. *Beckman Instruments, Inc.*

For more data, circle No. 475 on p. 18

Monorail Systems

Bulletin M-646 illustrates several monorail installations. Many of the various components of the monorail system are also illustrated and keyed. Monorail crane accessories such as crane and hoist scale, manual and mechanical sheet lifter are also illustrated. *Industrial Crane & Hoist Corp.*

For more data, circle No. 476 on p. 18

Cut-off Wheels

Bulletin 6649, covering recommended specifications and wheel sizes for Manhattan Reinforced Foundry Cut-Off Wheels, is now available. Photos showing Tabor and Fox Cut-Off Machines equipped with Manhattan Wheels are included. *Rabestos-Manhattan, Inc.*

For more data, circle No. 477 on p. 18

Refractory Mold Binder

Booklet F-8265, "Precision Casting With Ethyl Silicate," is a guide to the use of this material as a refractory mold binder. Technical data Sheet F-7250A describes the three types of ethyl silicate—their specifications and physical properties. *Carbide and Carbon Chemicals Co.*

For more data, circle No. 478 on p. 18

Refractory Cores

Refractory Strainer Core Shapes and Louthan Breaker Core Shapes are described in four-page two-color pamphlet now available. No spalling or erosion are advantages claimed for the Refractory Strainer Core Shapes. *Louthan Manufacturing Co.*

For more data, circle No. 479 on p. 18

Facts About Zirconium

New booklet, "Facts About Zirconium," is a compilation of information about the history and production of zirconium. Mechanical and physical properties, chemical properties and facts about fabrication of zirconium are discussed. *Carborundum Co.*

For more data, circle No. 480 on p. 18

Foundry Practice

New quarterly mailing piece, "Foesco Foundry Practice, No. 1," is now available. Purpose of the magazine is to deal mainly with the basic facts of melting and casting metals, the daily troubles which arise, and how best they can be overcome. *Foundry Services, Inc.*

For more data, circle No. 481 on p. 18

Dielectric Ovens

Bulletin No. 654 describes and illustrates the new line of Coleman Dielectric Core Ovens. Brochure outlines advantages of the new ovens and describes the operating features. Other lines of Coleman core and mold ovens are also illustrated. *Foundry Equipment Co., Dept. D1.*

For more data, circle No. 482 on p. 18

Dust Collectors

Bulletin D-53-30 describes the Uni-Wash Dust Collectors. Both Junior and Senior models are fully described with engineering data, dimensions and application photographs. Direct driven units and vee-belt units are explained in detail. *Newcomb-Detroit Co.*

For more data, circle No. 483 on p. 18

Cleaning Guide

How-to-do-it charts based on actual inplant maintenance procedures are a feature of the new Plant Maintenance Cleaning Guide. Designed for quick reference, the charts list recommended cleaning materials, methods of application, and many others. *Oakite Products, Inc.*

For more data, circle No. 484 on p. 18

Product List

Revision of "A List of 'dag' Dispersions for Industry," is now available. Includes representatives of a new line of "dag" Dispersions, which make use of the novel and valuable epoxy resins as media for dispersions of 'dag' Colloidal Graphite. *Achson Colloids Co.*

For more data, circle No. 485 on p. 18

Sand Riddles

Folder describes the Beardsley & Piper line of foundry sand riddles. Champion Stand-type and Suspension-type riddles for side floor riddling of facing or all-purpose sand are explained. Specifications and illustrations are also included. *Beardsley & Piper.*

For more data, circle No. 486 on p. 18

Letters to the Editor

All letters of broad interest which do not violate AFS policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Who Can Help?

I would like to find a job in an American or Franco-American firm. I have a mechanical engineering degree from the Ecole Centrale Lyonnaise, have a practical knowledge of molding, designing, metallurgy, and have worked for one year in the United States.

FREDERIC REY-HERME
Loire, France

I am a foundryman's son and have wanted to go to your country as a technical trainee. I now have the opportunity to visit the U.S. for six months. I am an engineer in mechanics and foundry, 28 years old, with five years experience in gray iron work in France, England, and Sweden. Could you help me find a place in a gray iron foundry for that period of time?

G. CHENESSEAU
Fonderies D'Orleans
Orleans, France

If any of our readers can assist, write to AMERICAN FOUNDRYMAN—EDITOR.

Wow . . . . . ! !

In your cartoon, Casting Through the Ages, for May, 1954, on page 214, you say the Great Bell of Moscow weighs 400,000 *tons*. Some bell!

BERNARD COLLITT
Director
Jenkins Bros., Ltd.
Montreal, Can.

Actually, the bell is estimated to weigh between 400,000 and 470,000 lbs. It is 22 ft 8 in. across the mouth, 19 ft 3 in. high, and 23 in. thick where the clapper strikes—EDITOR.

The Future for Castings?

Could you tell us how many pounds of castings were produced in 1953, 1950, 1945, 1940, 1930, 1920, and 1910, to help us in planning what to do with our foundry in the future? If there has been a definite increase during these years, it will have some bearing on modernizing our plant. Before spending any money, we would want to know whether the casting business is on the increase.

GENERAL MANAGER
Gray Iron Foundry

Long-range foundry prospects look bright. There seems to be unusual agreement among bankers and research analysts, indicating that business conditions generally in 1954 would be about 4 per cent below 1953, and that 1955 would drop another 6 per cent below 1954. Some recovery is forecast for 1956 and a definite increase in 1957. Two years ago, the President's Committee on Economic Research forecast an enormous demand for castings by 1975, about 25 million tons. There have been so many technical developments in foundry practice since 1910 that direct comparisons of tonnages are meaningless. Figures for 1952, last full year on record, show something like 16 million tons of gray iron castings, 3 million tons of steel castings, one million tons of malleable iron, and somewhat less for non-ferrous.—EDITOR.

Spectacular Quality Control

We discussed with great interest your article *"Quality Control in the Foundry"* (AMERICAN FOUNDRYMAN, Jan. 1954, p. 50, J. M. Barabee, International Harvester Co. Chicago). In order to make the control system more spectacular to our people, we would appreciate additional information regarding the results of quality control in improving the quality in the foundry.

DR. E. M. H. LIPS
N. V. Philips' Gloeilampenfabriken
Eindhoven, Netherlands

It would be very difficult to give overall figures on foundry improvements due strictly to quality control. At present, there is no program set up which would separate such improvements and say they were the result of the quality control activity, which is basically a service function to all production sections. However, where quality control has been very successful, two of our foundries now operate at about a 2 per cent scrap level.
—J. M. BARABEE

Shells From Matchplates

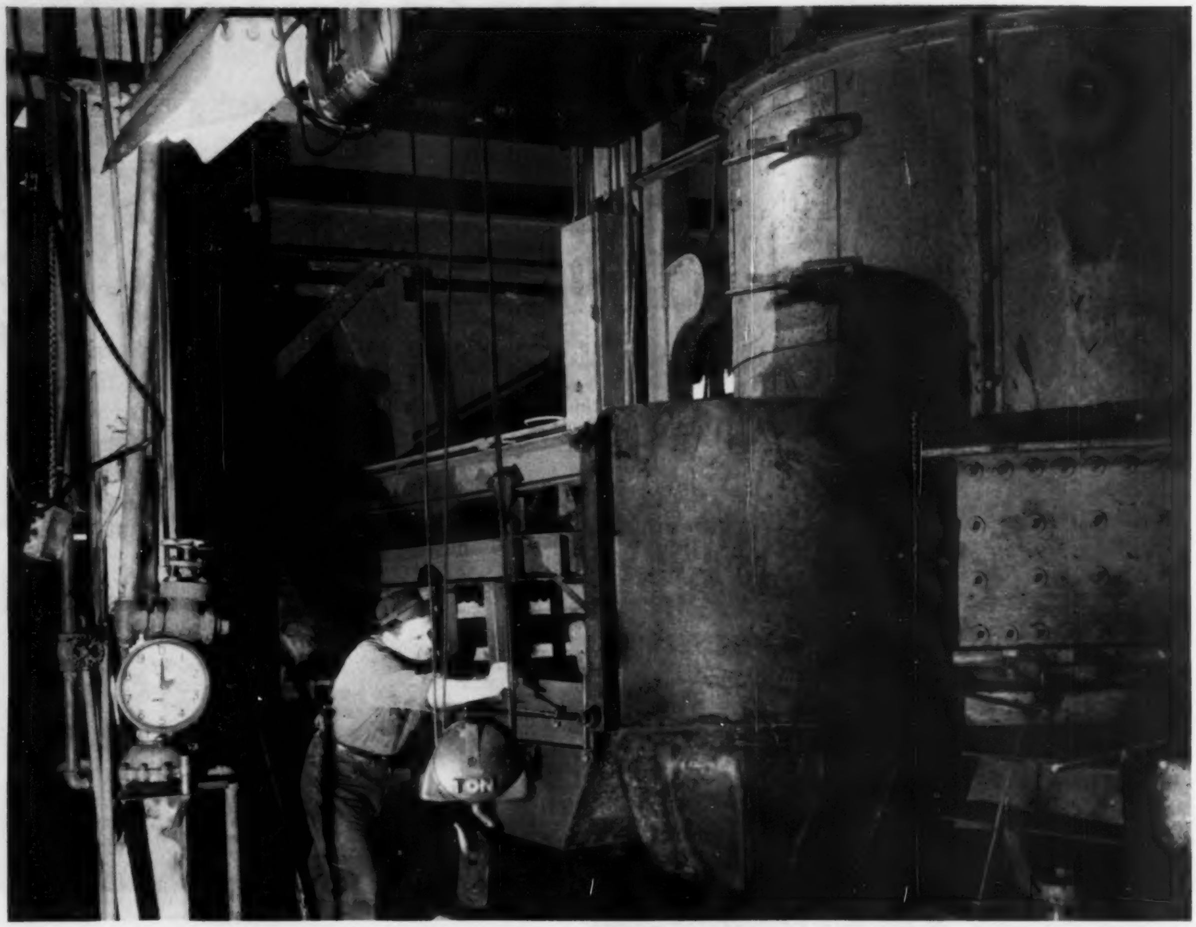
We have a plate pattern for a part that requires several cores and would like to get shells off that pattern. Minor changes on pattern can be made if necessary. Would you advise us of any companies that could possibly do this work for us?

PURCHASING AGENT

If your foundry can handle this type of production, write AMERICAN FOUNDRYMAN—EDITOR.

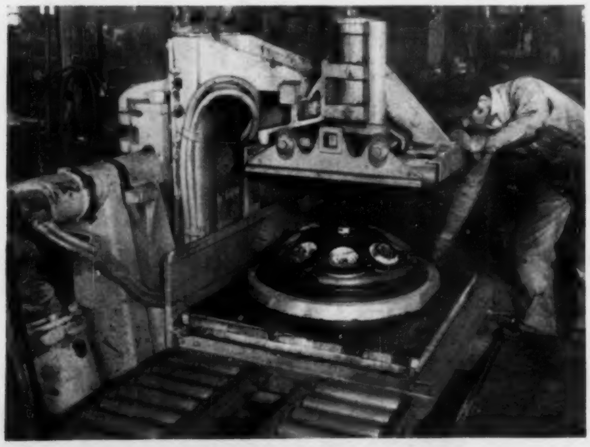
Employee Retires After Half-Century

Col. J. S. Ervin (right), president, Mackintosh-Hemphill Co., Pittsburgh, Pa., presents a gold watch to John Sepetauc, who recently completed half a century of service and has retired from duty as a ladle repairman. C. V. Wilt, (left), who started to work the same year and is now manager of the Garrison plant, extends his congratulations.



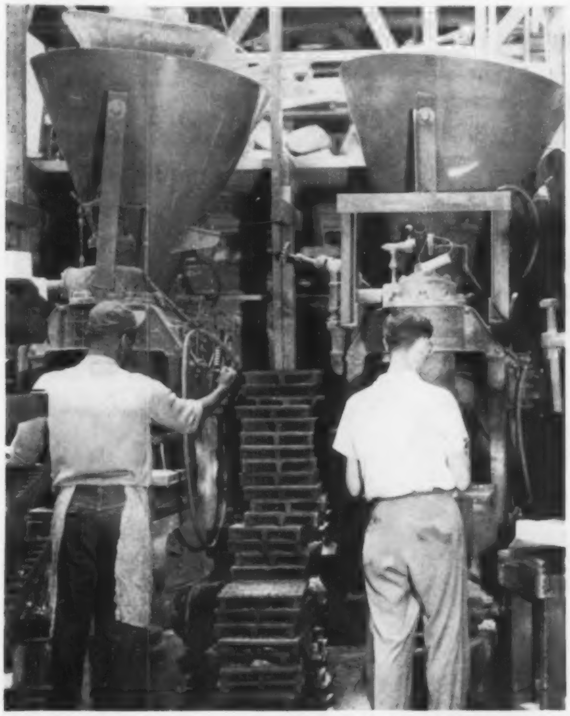
These Foundries Report Profits!

SPEEDMULLORS ON BOTH MOLDING LINES at the I. F. Sales Company foundry at New Philadelphis, Ohio, thoroughly mull all of the all-purpose sand required for 250,000 malleable castings per month. The sand is reused many times a day and enters the "70" Speedmullor (shown above) and the "50" on the other line, very hot. Speedmullor Cooling cools the sand *during* mulling. *For full information write Beardsley & Piper, 2424 N. Cicero Avenue, Chicago 39, Illinois.*



SPECIALLY DESIGNED FOR SLINGER INSTALLATIONS, this J & J Rol-A-Draw rolls over and precisely draws the molds rammed on a slinger-roller conveyor molding unit at Casting Service Corporation, LaPorte, Indiana. The Rol-A-Draw greatly simplifies the job of mold and pattern handling. *For full data write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Illinois.*

ON THIS DIFFICULT COREMAKING JOB, CHAMPION JOLT ROLLOVERS are doing a fast precision job. The very deep-finned insert cores for aluminum cylinder heads are produced in large quantities. To fill and draw the deep thin fin sections requires perfect Champion jolting action and a precision Champion draw. *Obtain full data by writing Beardsley & Piper, 2424 N. Cicero Avenue, Chicago 39, Illinois.*



SCREENARATORS AND J&J JOLT SQUEEZERS handle much of the side floor molding at Harsch Bronze in Cleveland. *For more information write to Beardsley & Piper, 2424 N. Cicero Avenue, Chicago 39, Illinois.*

A JR. NITE GANG CUTS COSTS in side floor molding sand preparation at the Kasper Foundry, Elyria, Ohio. *For full information write to Beardsley & Piper, 2424 N. Cicero Avenue, Chicago 39, Illinois.*

CHAMPION FLEXIBLOS IN THIS MAGNESIUM FOUNDRY mean real savings on small and medium size cores. In producing precision magnesium aircraft castings, the Howard Foundry in Chicago depends on Champion Flexiblo Core Blowers and Speedmullors. *For more data on this interesting operation write now to Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Illinois.*

PITTSBURGH STEEL'S FOUR SPEEDSLINGERS AND A SANDSLINGER ram a major portion of that foundry's molds. Jobbing work ranging from several pounds to well over 200,000 pounds is produced. Slingers are indispensible in this operation. *For the full story write today to Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Illinois.*

Foundrymen in the News

J. R. Allan, recently retired manager, Industrial Engineering and Construction Department, International Harvester Co., Chicago, has announced the formation of Allan Industries, Inc., of which he is president. Mr. Allan will operate from Melbourne, Florida, furnishing a consulting service in foundry, manufactur-

J. R. Allan . . . Florida consultant

ing, industrial, construction, air pollution, and industrial safety problems. An Honorary Life member of AFS, Allan will continue as chairman of the Safety & Hygiene & Air Pollution Control Committee.

H. J. Cutler, Jr., has joined American Fire Clay & Products Co., Canfield, Ohio, as sales engineer to the foundry field. He has been plant metallurgist for the American Radiator and Standard Sanitary Corp., Buffalo, N. Y., for the past six years.

Ford Motor Co., Dearborn, Mich., has made several changes in foundry management. **Frank C. Riecks** is now technical assistant to the manager of foundries, engine and foundries division, having been promoted from project manager,

H. E. Gravlin . . . Lincoln-Mercury Supt.

plant engineering, central staff. **John W. Schneider,** former manager, Specialty Foundry, has been named manager, Dearborn Iron Foundry. **Harold C. Grant,** former production manager, has succeeded Schneider. **Harry E. Gravlin** has been appointed general production superintendent, Lincoln-Mercury assembly plant, Wayne, Mich. He was formerly production manager, Dearborn Iron Foundry.

Peter E. Kyle has resigned as professor of metallurgical engineering at Cornell University, Ithaca, N. Y., to join the research and development firm of Les-

P. E. Kyle . . . leaves Cornell

sells & Associates, Inc., Boston, as vice-president. Prof. Kyle has headed the AFS Sand Research project at Cornell for several years.

G. J. Fischer has been appointed director of the metallurgical department of Sam Tour & Co., Inc., New York, where he will supervise such activities as investigation of metal failures in accidents, expert legal testimony for admiralty insurance and accident cases, research and development of new alloys and processes, and product development and evaluation. Fischer has been a metallurgist at West-

F. W. Riecks . . . new technical assistant

E. A. Swensson . . . sales and service

ern Electric Co. and, before that, an instructor at the Polytechnic Institute of Brooklyn (N. Y.).

E. A. Swensson has been made sales and service engineer for Herman Pneumatic Machine Co., Pittsburgh, Pa., and will handle molding machine sales in the state of Michigan, and the cities of Toledo, Ohio, and Windsor and Sarnia, Ont., Canada. His office will be at 2970 W. Grand Blvd., Detroit.

E. C. Hansen has been made manager of the new Buffalo (N. Y.) office of C. E. Bartlett & Snow Co. He has been with the company's home office in Cleveland in engineering and sales since his 1951

E. C. Hansen . . . Buffalo manager

graduation from Case Institute of Technology. He will service Niagara Falls, Schenectady, Rochester, and western New York State.

D. F. McCandlish, manager, Air Reduction Sales Co. Chicago district office, has been made regional manager of the North Central region in Chicago.

Thomas Drever, chairman, American Steel Foundries, Chicago, has accepted the chairmanship of the steel foundries division of the National Safety Council, which plans to raise $950,000 for the public service program.

D. E. Matthieu, formerly with Alabama Pipe Co., Annison, Ala., has become district sales manager, Kerchner Marshall & Co., Richmond, Va.

Continued on page 28

Foundrymen in the News

continued from page 26

Dr. Augustus B. Kinzel has been appointed director of research for Union Carbide & Carbon Corp., N. Y., in which capacity he will be responsible for the administration and coordination of the research activities of all divisions of the corporation. Dr. Kinzel has been engaged in research with the firm since 1926, when he joined Electro Metallurgical Co. as a research metallurgist.

Hans Arnold Arppe, foundry engineer, A. Ahlstrom Oy., Karhula, Finland, is completing an 8-month visit to the U. S. with inspections of Midwest steel foundries. During this period, he will investigate steel casting production operations in small, medium, and large plants, as well as shell molding and non-destructive testing methods.

The International Division of Hewitt-Robins, Inc., Stamford, Conn., has announced two promotions. **J. J. Murray** of Rockville Center, L. I., N. Y., has been made manager of foreign sales. **J. J. Sheehan,** Westport, Conn., is now manager of foreign operations, and will be responsible for general management policies and activities of foreign subsidiaries and affiliates.

Samuel H. Cleland, Michigan manager, Eastern Clay Products Dept., International Minerals & Chemical Corp., has retired at the age of 75. His son, **Robert Cleland,** formerly district sales manager, will succeed him. **W. J. Burke,** formerly with Davenport Machine & Foundry Co., has joined Eastern's engineering staff to head up the service and development of molding machine operations. **W. Adams** has been assigned to special products on a national basis.

A. L. Brooks has been appointed assistant to the manager of purchasing at Kaiser Aluminum Corp's. Oakland, Calif., headquarters. Prior to this appointment, Brooks was on Kaiser's Washington (D.C.) staff, and later project manager in Newark, Ohio, for the firm's heavy forging press program.

Paul W. Vanderburg, formerly manager of general industrial sales, has been appointed manager, equipment manufacturers' sales section of the valve and fitting department, Crane Co., Chicago. He will continue to manage sales of turbo-drive equipment and castings.

Peter J. Jensen has been promoted to manager of manufacturing, Carboloy Dept., General Electric Co., Detroit. Jensen has been manager of Carboloy's Michigan sales district since 1948, a position in which **John A. Muldoon** will succeed him.

Whitehead Metal Products Co., Inc., has elected **E. W. Silver** as a company director. Mr. Silver has been secretary-treasurer since 1942. **E. W. Lothman** has been named secretary of the company, succeeding Mr. Silver, who continues as treasurer.

Wm. Jost . . . general supt., steel

W. A. DeRidder has resigned as a director and chairman of the board of General Metals Corp., San Francisco. He will be retained as consultant to the firm.

Continental Foundry & Machine Co., East Chicago, Ind., has appointed **P. A. Pierce** as manager of operations. Formerly manager of foundries, Pierce began with the company in 1920 as a pattern maker.

R. Utz . . . National Malleable executive

National Malleable & Steel Castings Co. has made two executive promotions at its Chicago plant. **Richard Utz,** former assistant general superintendent, has been appointed to the new post of general superintendent of the malleable division. **William Jost,** chief inspector, is now general superintendent of the steel division, also a newly-created position.

W. H. Pender has been appointed manager, belting sales, Quaker Rubber Corp., division of H. K. Porter Co., Inc., Philadelphia. He was formerly field engineer for conveyor and elevator belting.

Whiting Corp., Harvey, Ill., has made several personnel changes. **B. L. Heinen** has been assigned to the Houston, Texas district office. **E. V. Piazza** has been transferred from Cincinnati sales to the St. Louis district office. **C. D. Schmidt** has been assigned to the New York district sales office. **A. C. Patsavas** has been transferred to the Cincinnati office.

National Carbon Co., division of Union Carbide & Carbon Corp., has appointed **A. C. Bryan** vice-president and general manager of consumer products; and **W. H. Feathers** vice-president and general manager of industrial products. **W. A. Steiner** has been named vice-president in charge of development.

Arthur Tauscher is now plant engineer in charge of maintenance and construction for Cooper Alloy Foundry Co., Hillside, N. J.

Dr. A. B. Kinzel . . . heads U.C.C. research

P. A. Pierce . . . Continental manager

A. Tauscher . . . Cooper Alloy engineer

Lindberg-Fisher Electric Resistance Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities 250 to #1000 crucible.

Lindberg-Fisher type MNP nose-pour tilting crucible furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to #800 crucible with brass, up to #1000 crucible with aluminum. Oil or gas fired. Described in Bulletin 57-A.

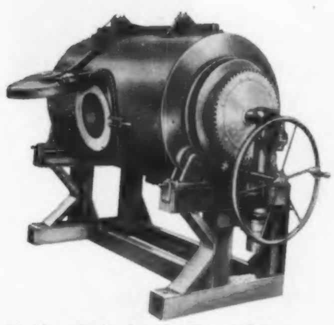
For Non-Ferrous Metals
A complete line of

LINDBERG FISHER

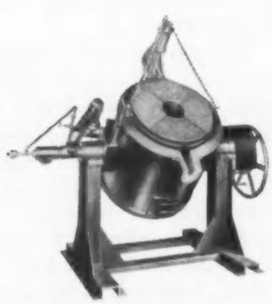
MELTING AND HOLDING FURNACES

For Melting Aluminum • brass • yellow brass bronze • copper • copper nickel alloys • lead magnesium • nickel • tin • zinc.

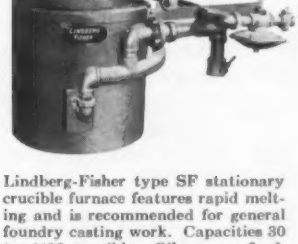
Because Lindberg-Fisher builds *all* kinds of melting equipment ... gas ... oil ... electric ... induction, and Carbon arc ... L-F engineers are able to recommend, without prejudice, the proper type of furnace for *your* particular melting requirements.



Lindberg-Fisher Simplex Rotary Open-Flame Furnace. Capacities to 2400 lbs. aluminum. 6000 lbs. brass. Oil or gas fired. Described in Bulletin 29-A.



Lindberg-Fisher type BB1 Hand-Tilt Crucible Furnace. Tilting mechanism consists of a hand wheel, driven through machined worm gear and pinion reducing gears. Capacities 50 to #400 crucible. Oil or gas fired. Described in Bulletin 400.



Lindberg-Fisher type SF stationary crucible furnace features rapid melting and is recommended for general foundry casting work. Capacities 30 to #400 crucible. Oil or gas fired. Described in Bulletin 301.

Melting specialists for 25 years
Sales and service offices in principal cities

LINDBERG FISHER **MELTING FURNACES**

A Division of Lindberg Engineering Company, 2440 West Hubbard Street • Chicago 12 • Illinois

A break at the end

...or how Chuck Wright made certain of success in every way

"You know how competitive the machine tool business became after the Korean War. Customers became real choosey," remarked Chuck Wright, foundry specialist for the INCO distributor.

"One company I call on," continued Chuck, "the Dever Machine Tool Works, decided that open grain in lathe ways absolutely had to be improved. So, Pete Pitlak, foundry superintendent, began to cut silicon. And inspection showed he was successful... the open grain disappeared.

"But a week or so later, the roof caved in. Because when the machine shop had gotten around to machining these castings, they found hard spots, chills and no end of chipped corners.

"Pete had started off to get rid of open-grained iron in his heavy-section castings...by running down the silicon in his iron until he got the density he wanted in heavy lathe ways and the like. The result was fine. But even these heavy castings had light sections . . . edges of pedestals or legs, for instance . . . that came out hard and brittle, and caused a peck of trouble for the machine shop.

"His biggest trouble, however, came from using the same iron for smaller machine tool castings. That really started a fracas. In some castings the ends of the ways came out so hard that machinists operating the planers chipped or broke off end pieces large enough to scrap the whole works.

"After arriving in answer to Pete's call for help, I explained how he could use nickel to suppress chill in light sections, and so get machinable, close grained iron in all sections. Nickel additions help you get all the benefits of a low silicon iron without any of the disadvantages.

"Pete got the idea. Nickel renders iron uniform in all sections. With 1.5 to 2% nickel, he used his low-silicon mix for both light and heavy castings. Those given a flame hardening of the ways developed the desired hardness with a minimum of warping. You see, nickel lowers the critical point, reducing the amount of heat needed. As a result, stresses from the "quench" at a lower temperature are reduced.

"Don't sweat alone with a metal problem. Do as Pete did. Drop me a line . . . I'll be glad to come out and give you some practical help."

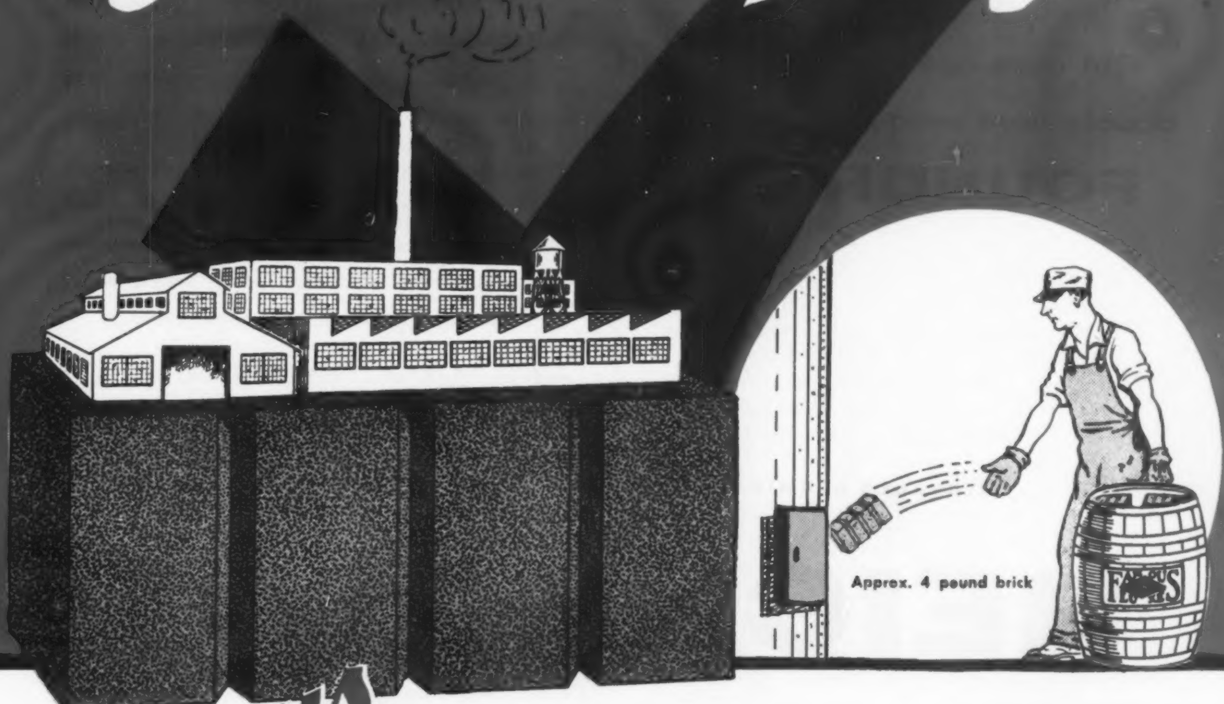
Chuck Wright

EMBLEM OF INCO SERVICE

The International Nickel Company, Inc.

67 Wall Street New York 5, N.Y.

The foundation for more profit



Famous CORNELL CUPOLA FLUX

A "must" in leading gray iron foundries and malleable foundries with cupolas.

WHEN you eliminate the main cause of casting scrap (impurities in molten iron) you lay the foundation for a better profit and a better product.

Famous Cornell Cupola Flux cleanses and conditions molten iron, so that you pour cleaner, tougher, stronger castings. Furthermore, it greatly reduces sulphur and keeps slag fluid.

Reduced maintenance, too, adds to your profit. Cupolas are cleaner. Erosion and cutting in the combustion zone is greatly reduced, due to a glazed or vitrified surface which is formed on brick or stone.

Famous Cornell Cupola Flux is made in Pre-Measured Scored Brick Form for easy handling—and time saving.

WRITE FOR BULLETIN NO. 46-B

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

Talk of the Industry

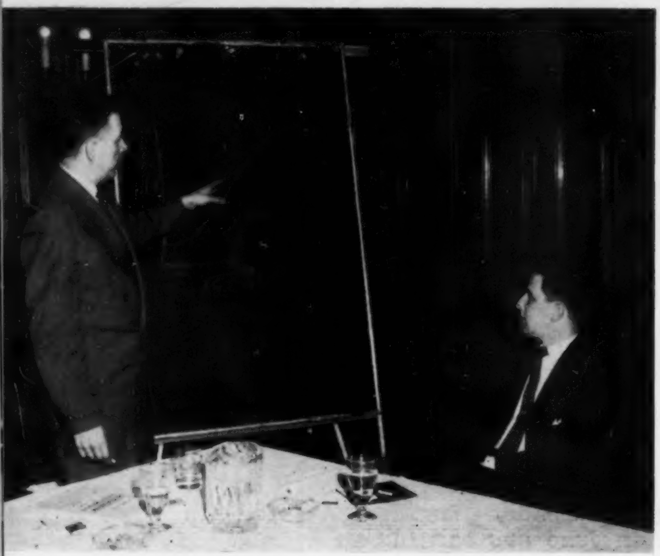
NO ENGINEERING SUBSTITUTE exists for castings, R. L. Gilmore, president and general manager, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., said in speaking at the annual meeting of the Malleable Founders' Society recently. There is no other way to put metal where it is wanted . . . so accurately . . . at so little cost . . . with so little expenditure of labor and materials.

AVERAGE STARTING SALARIES of engineering graduates are leveling off in mid-1954 after spiraling for over a decade. Engineering students who received bachelor's degrees in June are earning an average salary of $363 per month, only $1 more than a year ago. Average beginning salary for the January 1954 engineering class was $373. Data show mechanical engineering graduates earning $373 ($377 in 1953), metallurgical engineers $377 ($317 in 1953). Trend indicates advent of a period of stabilization, not a recession, according to E. C. Kubicek, director of placement, Illinois Institute of Technology, Chicago.

MAINTENANCE COST to industry will double in the next decade, reaching an annual rate of about $22 billion, according to H. F. McCullough, general manager of G-E's service shops department. Speaking to 150 engineering, manufacturing, and maintenance executives of the Cleveland area in the first of a series of productive maintenance forums, McCullough said that the accelerating trend toward automation in industry will greatly emphasize the need for a planned maintenance program.

SOMETHING NEW, SOMETHING BETTER, something the customer will want—the manufacturer must be alert to these requirements in order to meet competition in today's market. But it isn't enough just to make this kind of product, it must be shown and demonstrated where the right people can see it. A prime example was the recent AFS Foundry Exhibit at Cleveland, says G. T. Trundle, Jr., chairman of the board, Trundle Engineering Co. and Trundle Associates, Inc. Writing in Trundle Talks, No. 176, he said: "I have been a close student of industrial equipment for years—but I don't know when any trade show has impressed me as much as did the [AFS] Foundry Show . . . It is the display of something which activates human desires that pries money out of idleness and puts it to work on behalf of production, employment, prosperity, and profits . . . The Foundry Show demonstrated every conceivable new development in the making of castings. It brought these new developments out front and explained them. It performed an aggressive sales job."

AN X-RAY MICROSCOPE THAT "LOOKS INSIDE" magnified specimens has been developed by General Electric Co. The new instrument, which magnifies up to 1500 diameters, is expected to aid in production of new alloys and in studies of corrosion and welding of metals. The microscope uses an x-ray source of only 1/100,000 in., allowing greater magnification without distortion. It is claimed to provide stability for longer exposures needed for high quality pictures, and is the first to use a built-in camera that produces photographs immediately after a subject is exposed.



A·F/roundtable

Booth (standing)—"When you add enough soda ash to get a pH above 10, you better watch out!"

Dalton (seated)—"How about changing the pH of the system sand in order to reduce or eliminate the use of facing sand?

pH Control of Foundry Sand

Seven Milwaukee-area steel foundrymen and the man whose paper stirred up the first interest in pH of foundry sands met for a Round Table meeting, at the invitation of American Foundryman, to discuss their experiences with pH-controlled sands. Participating in the discussion were: Bradley H. Booth, foundry engineer, Carpenter Bros, Inc., chairman; Victor E. Ziemer, superintendent, and Ted Mikolajewski, sand technician, Maynard Electric Steel Castings Co.; Dan A. Lucas, superintendent, Stainless Foundry & Engineering Co.; Donald S. Dalton, sand control engineer, Belle City Malleable Iron Co., Racine, Wis.; Walter E. Brandt, metallurgist, Pelton Steel Casting Co.; David C. Zuege, technical director, Sivyer Steel Casting Co.; and Norman Koch, metallurgist, Grede Foundries, Inc. Here are their ideas on this new phase of sand preparation and control.

Booth . . My interest in pH of foundry sands was initiated about five years ago by Prof. George J. Barker of the University of Wisconsin. He suggested some work on pH as a subject for a master's thesis to round out some night school courses I was taking. Prof. Barker has done considerable investigational work and consulting on pH of clays, and he pointed out that refractory companies adjust the pH of fireclay to make the refractory more plastic and to make a denser brick. The companies save in the production of the brick by reducing the power required to force the damp brick mix through the dies. . . He had sample bricks, some so porous you could break them by hand, others as dense as concrete, requiring a hammer to break them. Mixture used was identical, only one had a pH of 5, the other 7.

This appealed to me as something that might be applied in the foundry, so I started work on the effect of pH changes on foundry sands. Rather than tackle the lifetime job of investigating every sand and combination of sands, I took 12 natural sands and one electrolyte, sodium carbonate. I chose Na_2CO_3 because it is cheap and easy to handle, and Barker had used it in his firebrick work. One per cent was set as the limit beyond which fluxing might occur, and tests were run with the following concentrations of Na_2CO_3: none, 0.002, 0.005, 0.010, 0.020, 0.050, 0.100, 0.200, 0.500, and 1.000 per cent. Most natural sands are acid with pH's of 5 to 7, but I found values for sand alone that ranged from 5 to about 10.

Curves for the sands all had essentially the same shape, but the knee of the curve comes at different points for different sands. In some cases it might be at 0.1 per cent Na_2CO_3, in other cases 0.2 per cent. In all cases, there is a section of the curve indicating a rapid increase in pH followed by leveling off at 0.5 to 1 per cent and beyond. On refractory mixes, Barker tried to operate at the knee of the curve which would be at a point where additional amounts of carbonate would create only a slight change in pH.

In foundry sands, you find that as the pH value increases, the sand properties will be affected. For example, dry strength increases tremendously as the pH value is raised by Na_2CO_3. Green strength reaches a maximum in most cases and then drops off as the pH goes up, though on some sands you won't see too much difference in green strength. Permeability also reaches a maximum, the curve resembling the green strength curve. In general, the permeability will reach a maximum at a higher pH value than the green strength.

It didn't appear to me that green strength would be too practical a thing to try to control by changing pH, but dry strength can definitely be improved. To prove that, we ran some tests on production castings at a Milwaukee foundry. A big core weighing about two tons was selected. Pitch was being used for a binder. We took out half the pitch, increased the pH from 7 to 9, and developed higher dry strength than they were formerly getting. The casting came out very well, and the sand peeled off much better than it did with the original mix. From that one investigation, it looked like pH control might have some practical application.

In my tests, I used 25 grams of sand in 50 ml of distilled water. Others have since used different concentrations. We haven't investigated the effect of concentration, but it would probably vary with different materials. Eventually the test should be standardized. (EDITOR'S NOTE: The AFS Sand Division recently established a pH Committee to study this and other pH problems related to foundry sands.)

As an example of a more recent application of pH control, I can mention a Wisconsin gray iron foundry. The superintendent had been reading some of the recent AMERICAN FOUNDRYMAN articles on pH. He was greatly impressed with the idea that you could put a little carbonate in the sand and reduce the percentage of scrap castings. . . He was making cast iron columns which scabbed consistently. He couldn't find any soda ash, so he went to a supermarket, got some baking soda ($NaHCO_3$), and dumped a box into his sand mixer. The columns from this particular batch of sand were beautiful—no scabs, and a wonderful finish. He used all the baking soda without running into any more scabs. . . This one experiment isn't conclusive, but at least it's interesting.

Ziemer . . That condition sounds like what we had. We ran into very thin buckles, maybe 1/16 in. thick. We felt that increasing the pH increased the hot strength. Similarly, we had trouble with lower green strength . . . dropped about half a pound.

Booth . . Don Dalton approached the question of pH control from a very practical standpoint. He said, "If we're going to investigate pH, let's measure the pH of all the materials we're working with." He found that an illite type fireclay developed a pH of 4.2. A sample of Ohio clay ran 5.2. Cereals tested from 5.7 to 6.7. Rye flour ran 6.7. Seacoal you grind yourself came out neutral (7) while seacoal you buy ran about the same—7.1.

A Wisconsin silica sand ran 5.4, an Ottawa sand showed 6.3. One western bentonite ran 10, the highest pH value encountered on this particular type of bond. Other western bentonites were 8.8, 9.1, and 9.2. Southern bentonite was 4.65. It is claimed that southern bentonite runs 5 to 7, but in all the tests we've run it has been in the range of 4 to 5. One brand of wood flour has a pH value of 4.5. . . No test to report on iron oxide.

Dalton . . The water we used on these tests was distilled water with a pH of 6.1.

Booth . . Distilled water will not run 7 as you might think it should. It will vary.

Zuege . . We had some as low as 5.6, and that's why I think one of the first things that has to be done on pH, if it's going to be discussed nationally from group to group, is to develop a standard method of testing. We have found that the water you start with makes a difference. For instance, this afternoon the boys ran a couple of tests in which they used the same sands. The distilled water used had a pH of 6, while the tap water we used had a value of 7.4. The same sand, in the same proportions relative to the volume of water, tested 8.7 (we had soda ash in the mixture) with distilled water but only 8.3 with the tap water.

Obviously there's no use going around the country saying "We're getting good results at 8.8," while somebody else says "We think 8.8 is too high, you have to have 8.3," and somebody else says "8.8 is too low, you

Zuege (left)—"On the basis of our stainless floor and our stack molding, we feel that in a week's time we can notice the difference."

Ziemer (right)—"I was hoping for some improvement, but the actual results are amazing!"

should have 9.3," when you can vary your own results by half a pH unit on the same sands.

Mikolajewski . . We use distilled water with a pH of 6.5 to 6.8. . . Any commercial still should produce a pure product, I would think, and I've heard that some people run the water through the same still three times to make sure. . . Coming back to pH measurement, I'd like to know what percentage of sample others are using in their tests.

Dalton . . We used a 50 per cent ratio of sand to water; for bentonite, clays, cereals, and all other materials the ratio was 7½ per cent.

Lucas . . We ran tests on our present mixes (all our work is skin dried) and found the pH to be 6.8. We raised it to 8.3 and ran for two days. We feel this is too short a time to make any observations but had to stop running tests because of lack of space for setting up equipment. We are building a laboratory room and will resume work as soon as it is ready. . . We do not anticipate much improvement in surface finish, but have hopes that pH control will help get better packing in deep pockets. . . In the few tests we ran, we used 50 grams of sand in 50 ml of water.

Zuege . . We find that the difference in the amount of sand mixture isn't as significant as the difference in the water. For instance, we have run all the way from 10 per cent sand up to 60 per cent sand, and we came out with pretty much the same results. Because of this, we're using 10 grams of sand and 40 ml of water.

Brandt . . If there is a difference in pH between distilled and tap water, why not run the test with tap water? That's what you use in the mill—you don't use distilled water.

Koch . . We are using indicators to measure pH. We started out with indicator paper but readings were difficult to make because of material in suspension. Now we just take some sand—don't measure it—just put a small quantity in a test tube, put the indicator in, and read the color. We're about one pH unit low when compared with instrument readings. When we read 7.5, a pH meter reads 8.5. We find the same thing as Dave Zuege does with regard to water. We get more acidity when testing with tap water than we do with distilled water.

Now with reference to Wally Brandt's feelings regarding tap water. I don't think you can use tap water in testing. If you use regular tap water in your mix to start with, you should check pH with distilled water because you are checking the combination of ingredients and this includes the moisture. If you add tap water for the test, you change the pH.

Brandt . . But the question is still there. In your mill you use tap water.

Koch . . That's right, but when you take the sand mix containing, say, 3 per cent water and all the other ingredients, and add tap water to make a pH test, you're changing the conditions. When you add distilled water, you're not changing anything.

We find no difference between small amounts and large amounts of material tested. Larger amounts show a deeper color, but don't change the color itself. Sometimes we take only a third or a quarter of the normal sample, but we still get the same color although it is lighter.

Booth . . Has pH control been of any value to you?

Koch . . We think so. Our welding is down a little, and surface defects seem to be less common.

Booth . . Do you notice any difference in the feel or the workability of the sand?

Koch . . We've always worked with rather high strength —8.5 to 9 psi green compression—whereas most of the group works with about 6 psi, so we don't notice the difference.

Mikolajewski . . When we added soda ash to our mixes, we didn't tell the molders anything, and they wanted to know what we had done to the sand. . . We normally work at 5.5 psi.

Ziemer . . How far can you go? What is the upper limit?

Booth . . Barker made an interesting observation along those lines. As a result of his work with fireclays, he said that any change is good. Whether you start with 5, 6, 7, or 8, as long as you increase it you're improving. Maybe that's true of sand mixes too.

Ziemer . . At the start, we measured the pH of our regular sand mixes, then added soda ash and again took the pH, and finally we looked at the results on the molding floor. The first mold we made was a truck wheel with deep pockets and we did away with all drying and washing. Results were amazing. We've been running the same pattern for about 15 years so we had a good basis for comparison.

Zuege . . Well, that's about our experience so far. We spent a lot of time just trying to see how our sand is running, and we've been running a pH on certain of our sands for about a week. In most cases they are system sands. We feel just from observation that the castings are coming better. . . We don't have any statistics such as welding hours per ton. We can't get them until we run the whole shop on pH control, but on the basis of our stainless floor and our stack molding, we feel that in a week's time we can notice the difference.

Ziemer . . During our early months on pH control, inspectors would sometimes ask me if we had made a particular casting in high-pH sand. On one job we run once or twice a month, an inspector told me he

had a hard time finding castings in a lot of 100 to send to the welder. I was hoping for *some* improvement, but the actual results are amazing!

Koch . . Do you notice any improvement in core sands?

Ziemer . . We have worked a little with blower sands but don't have any real information although the operators say the cores blow a little better. The flowability of the sand has improved. The very first day we had some complaints about sticking, but they have tapered off. . . All we did was add soda ash to a blower sand running 6.1 to 6.5, raising the pH to about 7.5. It's a mixture without any clay and has a green compression strength of 1.1-1.3 psi. We measured pH as the sand came out of the mill.

Koch . . We found the pH was less after baking.

Booth . . Core sands are a different proposition from molding sands. In molding sands, you are dealing with oils, cereals, resins, and the like.

Koch . . Our cores have been giving us dirty castings so I've been waiting for the inspectors in the cleaning room to come up with observations that show whether we're getting any improvement.

Mikolajewski . . We have felt that the corners of the cores were sharper after baking, but we've changed two other factors since adding soda ash to core sand mixes, so we can't say whether pH did it.

Lucas . . Do you show any improvement in mold hardness?

Ziemer . . . Anywhere from five to 10 points. We've found this on both squeezer molds and bumper molds. Lab tests show that green strength goes down. . . The first squeeze mold we cast in pH-controlled sand had a pocket three-quarters of an inch wide and about 2¼ in. long. It was about 1¼ in. deep. Formerly, we didn't get good ramming in the pocket and we had to do a little peening in the shipping room to knock the sand loose . . . it wouldn't come out in the blast. . . Now, with the same casting, and soda ash in the mix, one blasting operation cleans it, and we get a nice, clean pocket.

Zuege . . Has the pH of your backing sand come up since using soda ash in the facing? You're not using it in your backing sand, are you?

Mikolajewski . . We're not using soda ash in the backing sand, and according to our figures there's no pick-up in the backing sand.

Brandt . . We add soda ash to the backing sand on one machine for this reason: they don't put facing around the gate. So we increased the pH of the backing sand to see what would happen.

Zuege . . You feel that in deep pockets, where you have just a thin layer of facing—the rest is backing sand that hasn't changed in pH—that the change in pH of the thin layer is responsible for the increase in mold hardness?

Ziemer . . Well, in a pocket like that, Dave, you practically couldn't get backing sand. It is all facing. That is one of the reasons we went into reclaimed sand . . . on the squeezer and bumper units, the consumption of new sand per ton of castings is high.

Dalton . . What about changing the pH of the system sand in order to reduce or eliminate the use of facing sand?

Zuege . . We're working with system sand but in the two places we're using soda ash we never did use facing sand.

Ziemer . . We've gone at it slowly. We started on green facing, then went into dry facing, and now we are into sand in the core room. Maybe we'd be smart to put soda ash in everything because the cost is so small. I think it costs us 4¢ for a 2500-lb mix, and I understand you can get the cost down to a one or 1½¢, depending on where you buy the material.

Brandt . . We add four ounces to a 1000-lb batch of new sand facing. We use all new sand facing. We have no reclaiming system, and figure if you put the sand in, you might as well use it for facing the first time.

Booth . . What's the build-up of carbonate in your backing sand?

Brandt . . It doesn't build up . . . just stays about 6.8 to 7. We've been at this for five weeks.

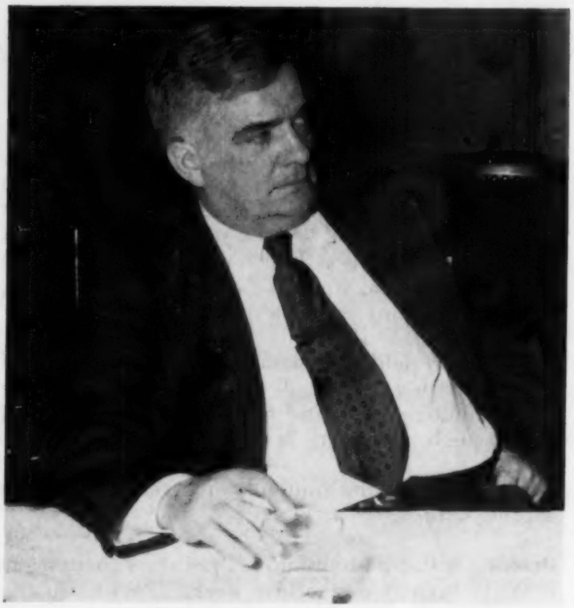
Koch . . We have been adding soda ash for about three months and there is no build up in backing sands. And we don't have a sand system.

Booth . . I suppose sodium carbonate breaks down at a fairly low temperature (EDITOR'S NOTE: Na_2CO_3

Brandt (left)—"How about trouble with hot tears because of increased dry and hot strength?"

Mikolajewski (right)—"When we added soda ash to our sand mixes, we didn't tell the molders anything. They wanted to know what we had done to the sand."

A·F/roundtable



Lucas—"From our work, I'd say your finish will be poor if you don't get some glazing action."

melts at 1564 F, but begins to lose CO_2 at 754 F) and in a shop where the sand is reclaimed, you wash it out.

Ziemer..Could we come up with a definite pH value that you could shoot for all the time . . . no matter where you are?

Zuege . . On our wood-flour core sand, we ran as low as 5.9 . . . our facing sands ran from 6.6 to 8.1 . . . on the black system sand we got as high as 8.1 on some tests without the addition of soda ash. But our new sand facing—a Wisconsin silica sand plus bentonite and cereal—is running about 7.2 or 7.3.

Mikolajewski . . When we started off, most of our batches ran 8.8-8.9.

Zuege . . We have a little fuel oil in our sand. That may affect it. I believe it would tend to be acid.

Brandt . . We add a quarter of a pound for what we call a 1000-lb batch, but we get a pH of 9.5 to 9.8. That's about two points higher than the sand without the soda ash. . . We find corners on the castings are better and in a month of use find about one-tenth of an hour per ton of castings difference in welding . . . but that's not enough to count.

Booth . . Most of you are adding sodium carbonate dry. How about the mixing?

Koch . . It seems peculiar that you can get such good distribution with such a small amount of material, but you do.

Booth . : Probably because soda ash is very soluble. It's not like putting in clay or something that has to be distributed physically.

Brandt . . When I first put soda ash in the sand I dissolved it in water. Went over to the grocery store and bought sal soda. It was granular, so I dissolved a pound in a gallon of water and added a quart to get the four ounces. Putting it in dry is just as good since it turns out that the distribution is just as satisfactory.

Booth . . The AFS Mulling Techniques Committee is working on mulling procedure right now. Preliminary reports indicate that on a laboratory scale, using 18-in. and 24-in. lab mullers, maximum properties are reached after five minutes. That's for molding sand. . . I don't think we've checked core sands so far.

Brandt . . Let's go back to the knee of the pH curve you talked about earlier. I've heard of a commercial additive that is always supposed to give a pH of 8.5. Something like that would prevent going over some desired maximum, wouldn't it?

Zuege . . That's like adding a buffer solution. You could throw away all your testing—simply add the buffer and you'd have the desired pH.

Mikolajewski . . We added half a pound to begin with, then added another half a pound, and it seems the extra half pound makes the tests run more uniform. With the first half pound, I got about 9.5 but tests ranged down to 9.2 and up to 10. Out of 40 tests, I got seven that were high or low. By adding the extra half pound, I got about 9.8 and it seems to be staying there.

Ziemer . . On that wheel I mentioned. . . First we used half a pound of soda ash in the mix. Occasionally when the casting would get to the cleaning room there would be a little roughness in the pocket. It would have a tendency to be stuccoed a bit.

Zuege . . I didn't know you made any bad ones with soda ash.

Ziemer . . I don't want to tell all our secrets. . . Anyway, we added that extra half pound and it improved the castings a little, so now we're in the process of putting it in throughout the system to see what results we get.

Booth . . Did you ever check the pH of your soda ash?

Zuege . . We get 10.3 to 10.5. When your sand tests as high as 10, you're getting near the upper limit.

Booth . . It might be interesting if some of you would run a pH curve on your sand to see just what you get. If you wanted to check green strength and permeability too, I believe you would find that there is a point beyond which it isn't worthwhile to go. . . When you add enough carbonate to get up to 10 you

better watch out in the foundry. You may be worse off than if you have no pH control at all.

Ziemer.. You mean you could add more soda ash, and it wouldn't show up in your pH, but it would react on your sand?

Booth.. Yes. You'd be adding more Na_2CO_3 but you'd notice very little increase in pH beyond the knee of the curve where it starts to level off. You could get a fluxing action in the sand. I think you can get into as much trouble by going too high as by going the other way.

Dalton.. In malleable iron, I got better results as far as scabbing goes by lowering the pH. I still had scabbing, but not so much. I had a smoother casting at a lower pH than at a higher pH. This was on regular system sand. We didn't have a meter and I was using pH paper. The sand normally runs around 5.5. I had pH's of about 7.2 and 4.5, and got a better looking casting at 4.5. However, I still had scabbing, the erosion type.

Ziemer.. On an oil sand mix for dry facing we found that increasing the pH reduced the penetration. Maybe it's due to a denser mold.

Lucas.. Would the fact that the fusion point of the clay was reduced by the addition of soda ash be responsible for the improved finish? We've tried high refractory washes and materials for facings, but we haven't obtained as good a finish as we do with the silica wash we're now using. We tried magnesite and various combinations of high temperature facings and high temperature washes, and had rougher castings than we had with lower refractory bonds and washes.

Brandt.. I think the soda ash provides a little fluxing action . . . it glazes the mold fast.

Lucas.. From our own work, I would say that if you don't get some glazing action, your finish will be poor.

Mikolajewski.. We've tried changing the pH of the core wash, too. On a wash containing zircon that had a pH of 6.9 we raised it to 9.5. The wash didn't settle out, but we couldn't see that the castings were improved.

Booth.. In case anyone is coloring core sands for purposes of identification, they'll want to be on the look-out for this. I heard about a wash being prepared that was to include a dye. When the dye was added, the wash settled quickly due to a change in pH. A different coloring agent had to be used. Even though colored sand mixes require only a spoonful of dye, it might cause some reaction.

Did you fellows see the article in the March issue of AMERICAN FOUNDRYMAN called *"pH Value—A New Foundry Term"*? The story says there is a possibility of enough variation in the reading of the meter to more than offset the difference in the sand, if the meter is not standardized correctly.

Another thing you will notice is that your readings won't be accurate if you don't clean the electrodes thoroughly. If you are testing bentonite, then follow up with a test on cereal, you'll get a bentonite reading on the cereal if the bentonite isn't cleaned off.

Zuege.. I don't believe any of us got right down to quoting figures on scrap reduction through use of pH-controlled sand. Anyone want to quote figures? In a lot of 10 castings, if five were made in regular facing, and five in facing containing soda ash, could anyone pick out the five made in the higher pH sand if he didn't know the soda ash was in the sand mix?

Ziemer.. I wouldn't say I could. My opinions in favor of soda ash in a sand mix are based on an overall picture. The reports I get from our inspection department—where people are looking for small imperfections—indicate definite improvement. I notice that the gates show less penetration and erosion. My gates are now salable castings!

Booth.. Let's summarize this discussion. Stop me if you disagree. No. 1—pH changes affect sand properties. . . To make this more specific, let's say pH control improves dry and hot strength, reduces snotters, and reduces sand expansion defects. How about penetration? Let's put down that pH control reduces penetration. . . Ted said his boys like the feel of the sand, so let's add "improves workability or flowability."

Can anybody think of anything that might not be so good?

Brandt.. How about trouble with hot tears because of increased dry and hot strength?

Booth.. OK. And another thing, I think we all agree that there should be a standard method of running a pH test on foundry mold and core materials.

Koch—"We use indicators. We're about one pH unit low compared with instrument readings."

DONALD E. MATTHIEU / *District Sales Manager, Kerchner, Marshall & Co., Richmond, Va.*

Eight Ways to Light-Off...

Cupola Bed Practice

Selecting coke for burner tunnels.

One of the most abused practices in cupola operation is preparation of the bed. How to do it correctly was told during a Gray Iron Shop Course session of the 1954 AFS Convention. The author was then chief metallurgist, Alabama Pipe Co., Anniston, Ala. The presentation was part of the recently released, revised and expanded book, *The Operation of the Cupola.*

■ Preparation, height, and burning-in of the coke bed are among the most critical phases of cupola operation. It is commonly agreed that any effort to economize here, without careful planning, may lead to costly melting difficulties.

The bed coke should be of uniform size to permit the free flow of air, and to promote rapid and uniform ignition of the bed. Very large lumps tend to form channels for the air and prevent uniform burning. Small lumps, on the other hand, have more surface area and therefore, may burn more rapidly. The bed coke may be hand picked to advantage since bed making and burning-in is essentially a hand operation, even where mechanical charging is available. The use of burned coke from the previous day's drop should be prohibited.

The chemical and physical properties will vary somewhat between different producers, but a foundry coke of the following general specifications should give good results.

Fixed Carbon	90%
Volatile Matter	1% max.
Ash	10% max.
Sulphur	0.7% max.
Shatter (% on 2-in. screen)	90%

Many competent operators consider an ideal coke size to be one-twelfth the effective diameter of the cupola. Recently it has been found that a coke size one-eighth the effective diameter works even more advantageously.

The method of lighting-off and burning-in of the coke bed is a matter of personal preference, and the method used is usually governed by the equipment available and the cost involved. The cheapest way is the best way as long as satisfactory results are obtained. Most popular methods of lighting-off involve: (1) gas or oil burners or torches, (2) wood kindling, (3) electric igniter, and (4) externally ignited coke. Proper burning-in is usually obtained with natural draft or induced draft. The latter method requires compressed air or the blower. In all, eight methods are recommended for lighting-off and burning-in the coke bed. These are:

1. Gas or oil burners or torches
2. Wood kindling
3. Induced draft
4. Kindling tuyeres
5. Electric igniter
6. Burners inserted in tuyeres
7. Gas or oil torch in breast opening
8. Externally ignited coke

Gas or Oil Burners or Torches. Probably the most widely used method of bed burning among large pro-

Building coke tunnels for burners. Coke should be uniform in size to allow unimpeded flow of air. Although coke one-twelfth effective diameter of cupola is commonly considered ideal size, recent practice tends to favor a size one-eighth the effective diameter.

duction foundries involves gas or oil burners or torches. The bed is ignited with burners or torches inserted through holes cut in the cupola shell and lining. The holes are located approximately 4 in. above the sand bottom and evenly spaced around the circumference of the cupola shell. The number of burners used is a matter of preference, but usually four are used for cupolas larger than 54 in. in diameter.

In lighting the bed this way, it is the usual practice to build coke tunnels by hand in front of each burner hole to allow the flame to penetrate the bed. In most cases the foundation for the tunnels is a 4-in. pipe laid in the burner hole and extending well inside the cupola. The hand-picked, uniform coke is then placed in such a way that the tunnels will support the overlying coke when the pipes are withdrawn and the burners inserted. This assures that the burner flame will penetrate the entire bed. Proper flame penetration must be attained for evenly burned bed.

Has Decided Advantages

This method of bed burning has some decided advantages that should be considered when selecting the bed burning practice to be used:

ADVANTAGES

1. Breast is thoroughly dried during the burning-in of the bed.
2. Permits preheating of lining and sand bottom.
3. Eliminates blanket of charcoal formed during wood burning operation thus minimizing freeze-ups.
4. Gives more positive control over the bed burning.
5. Reduces the danger of an unevenly burned bed often encountered when the blower is used.
6. Reduces the possibility of over burning the bed.
7. Comparatively short burning-in time.
8. Less variation in practice
9. Less ash formed.

DISADVANTAGES

1. Must have semi-skilled man to burn bed.
2. Bed building is time consuming and tedious.
3. Greater cost.
4. Expense involved in preparation of equipment.
5. Possibility of burn-out through burner hole if not botted properly.

After the cupola bed is ignited the fuel is cut off, but compressed air is supplied until the bed has attained a bright cherry red color. The bed is then leveled off and measured, the burner holes botted, and the charging is begun. Natural draft works well with this method but is somewhat slower.

Wood Kindling. When igniting the bed with wood kindling, slabs of wood are laid carefully on the sand bottom to absorb the impact of the additional wood and coke as they are charged. It is considered good practice to stand slabs of wood against the lining to form an inverted cone, and then to place the smaller miscellaneous pieces of wood into the cone to a depth slightly above the top of the tuyeres. Slabs and strips should be charged in a criss-cross fashion to provide adequate air space. The slabs standing upright protect the lining from being knocked loose by the additional wood and coke as they are charged. It is important that the kindling material be dry. Saw mill scantlings, waste from carpenter or pattern shops, scorched bottom boards, and any well dried, soft, easy burning wood make excellent kindling material. The use of hard woods should be discouraged because they burn too slowly to properly ignite the bed coke. Metal plates, fittings, nails and trim should be removed from all kindling as they tend to chill the molten first iron. These small metal parts may cause a freeze-up of the tap hole as the first tap is made.

Tuyere covers are left open and the wood is ignited, either through these openings, or the open tap hole by a gas or oil torch, or by burning, oil soaked rags. When the wood is burning freely but not until then, a third, half, or three-quarters of the coke to be used in the bed is forked in carefully. This step is most important. Unburned coke in the well can lead to cold iron and erratic operations that are practically impossible to overcome in a day's heat.

For an hour or so, the burning of the bed proceeds by natural draft until it has attained a bright even cherry red color throughout. The bed should be observed from time to time from the charging door. Any

Leveling initial coke bed. Since bed-making is essentially a hand operation, bed coke may be hand-picked to advantage, even where mechanical charging is available. Operation helps assure proper flame penetration, necessary for an evenly burned bed.

low spots or holes in the bed should be filled promptly with coke so that the whole bed burns evenly. Burning-in may be hastened by using partial blast for a few minutes at the finish. The use of full blower volume is considered poor practice due to the possibility of localized burning at tuyere area. Therefore the blower should be set to deliver a minimum amount of air or the tuyere peep holes should be left open to reduce the effective air volume to a point where the air is fed evenly through all the tuyeres, and no bright spots or excessively localized fast burning zones are observed.

When all the wood has been consumed but not until then, and when the top of the bed has attained an even cherry red color, showing that the bed has been burned through, the bed should be leveled carefully to the standard height as measured with a metal gage rod or chain, hung from the sill of the charging door.

Induced Draft. The use of induced draft in the bed burning-in practice, found to be satisfactory in several foundries, should be carried out with care.

In this method a wood fire is kindled, the blower turned on and half to three-quarters of the required bed coke is added immediately. It is considered good practice to leave the tuyere peep holes open and to set the blower to deliver a very small amount of air thus minimizing localized burning. The blast is continued until the top of the bed is burning uniformly with a bright cherry red color. Care should be taken to obtain an even burning-in. The blower is turned off and the remainder of the bed coke is added and the bed is leveled in the usual manner.

Some difficulty is encountered in establishing the desired bed height with a measuring rod because the coke occasionally seems to pile loosely, only to pack during the fill-up to a height that is lower than the desired operating bed height.

Kindling Tuyeres. Some cupolas are equipped with kindling tuyeres which open into the cupola at the top of the sand bottom. Usually there are four such tuyeres equally spaced around the shell. They are connected to the wind box so that a gentle blast can be applied through them if necessary. This method with gas or oil torches or wood kindling preheats the bottom sand and well very effectively. In addition an evenly burned bed is obtained.

With this method it is necessary to keep the main tuyere valves in good working order so that most of the draft for igniting the bed comes through the kindling tuyere. The kindling tuyeres are stopped up with a suitable ramming mix when burning is complete.

Electric Igniter. An electric coke igniter is now available for lighting off the bed. This method may grow in popularity because of the reduced tendency to smoke during the lighting-off and burning-in period. Many metropolitan areas are now establishing smoke ordinances which must be considered when selecting a bed burning method. The electric igniter shows promise in this respect.

The principle of operation is to ground the coke bed by passing an electrode through an insulated tube within the igniter barrel and at the same time to furnish sufficient air for rapid combustion. About 20 seconds after the arc is struck, the vibrator tube containing the electrode holder is withdrawn and a booster blast pipe is inserted. After the coke on the opposite side of the cupola is red hot the igniter is removed. Usually one igniter is used in cupolas up to 36 in. in diameter, two in cupolas from 42 in. to 66 in., and three on larger cupolas.

Burners Inserted in Tuyeres. Use of gas burners inserted through the tuyeres is found satisfactory by several companies who operate small cupolas. In this method lengths of 4-in. diameter pipe are placed in the tuyere openings slanted downward and wedged in place against the tuyere casting. About two-thirds of the bed coke is placed in the cupola, the pipes re-

moved thus forming channels in the bed so as to allow the burner flame to penetrate.

Usually two burners, each throwing an 18-in. flame, are used. They are inserted through separate tuyeres into the channel. When the adjacent coke has been ignited, the burners are withdrawn and placed into other channels until the entire bed is properly ignited.

Gas or Oil Torches in Breast Opening. It is an acceptable practice in smaller cupolas to leave the breast open, and carefully charge one-half to three-quarters of the coke to be used on the bed, igniting it with a gas or oil torch through the breast opening. One or more channels are formed by arranging pieces of coke along the bottom away from the breast to the back of the cupola. The number of channels depends on the size of the cupola. These channels permit even ignition of the bed and more uniform burning. When the lower layer of coke has been ignited, the torch is removed and the breast is made.

Externally Ignited Coke. To accelerate the burning-in operation a few foundries use the following procedure: A portion of the bed coke is ignited outside the cupola in a special grate-bottomed container while the sand bottom is being made. When ready, the ignited coke is dumped in place through the charging door. The bed is built up, leveled off, and when its height checks, the cupola is ready for charging. With this practice, it is very important that the patching materials be tempered with as little water as possible, since there is no opportunity for drying the lining repairs as in other bed making procedures.

Recommended Practice. It is recommended that the preparation and burning-in of the coke bed be carried out carefully, even if the day's heat is delayed. No phase of cupola operation is more important than to have a properly prepared and burned-in bed. It is a rare occasion when a poorly prepared bed can be corrected during the course of a day's heat. It is much more economical to take extra time and care to get off to a good start than to risk the loss of an entire day's production because of bad metal.

After the coke bed has been made and lighted, it is important that it be burned evenly and thoroughly throughout the entire bed. Localized hot spots should be eliminated by adjusting the burners and/or air supply. It is recommended that the bed be kept as level as possible during the burning-in period with the addition of coke forked onto the bed where low spots develop.

Most competent melters burn the bed until it attains a bright cherry color throughout the entire bed. It is an accepted practice, however, to top the burned bed with from six to 12 in. of green coke after it has attained the proper color. Care must be taken to prevent over burning.

The bed is always leveled off to a standard height and measured by a rod hung from the charging door sill. This standard height should always be used regardless of the weight of the coke that is usually required.

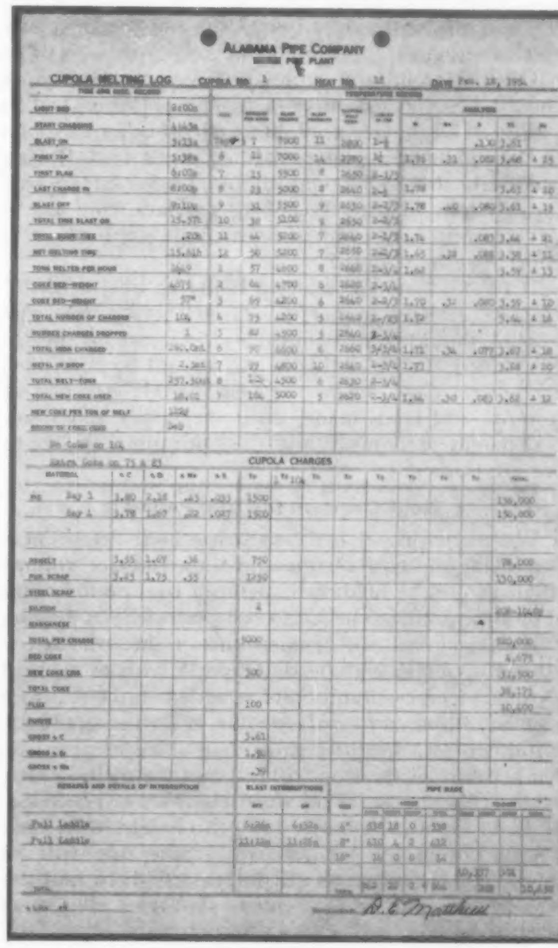
Ideal Bed Height. Choosing the ideal bed height is a problem that confronts every cupola melter at some time or other. This height, an all-important dimension, must be determined for the most part by experimentation. For conventional operation, the correct height in inches will probably fall in the range of $10\frac{1}{2}\sqrt{P}$ and $10\frac{1}{2}\sqrt{P} + 6$, where P is windbox pressure in ounces per square inch. Thus, for a cupola operating at a 16-oz windbox pressure, the proper bed height will be between 42 and 48 in. For a given operating pressure, the suggested bed height as calculated is the starting point for a series of careful experiments to determine the optimum bed height for the cupola in question. On the first day:

Level off the Bed

1. Level off the bed to the calculated height (using above formula), after the bed has been burned evenly and thoroughly.

2. Leave the tap hole open so that the first molten iron can be observed.

3. If the bed height is correct, a steady continuous stream of molten iron should flow through the tap hole in about eight to 10 minutes after the blast is turned on. A longer time interval accompanied by a dribbling stream of cold iron indicates that the bed is too high. A shorter time interval and a fair size stream of cold iron indicates the bed is too low. When the bed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CUPOLA MELTING LOG
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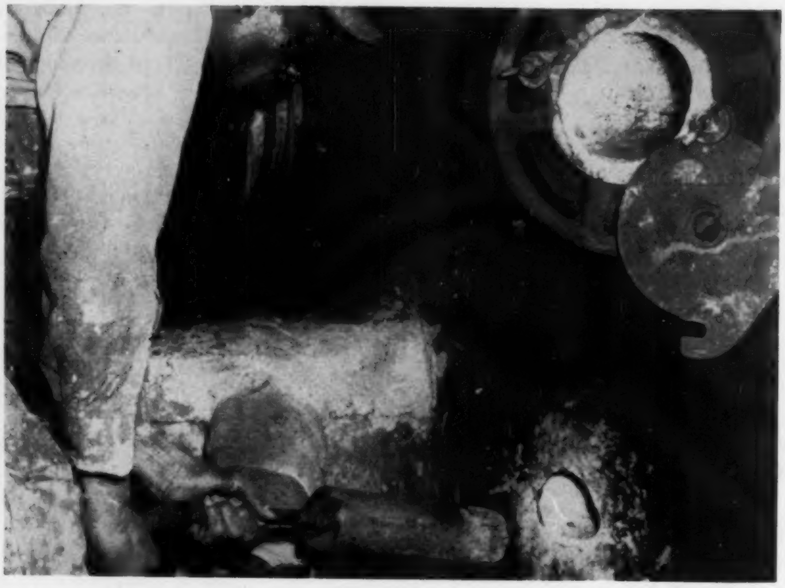
Complete cupola melting log for 16-hr heat.



Placing burner in burner hole. Holes are cut in cupola shell and lining, located approximately 4 in. above sand bottom and evenly spaced around circumference of cupola shell.

is excessively low, oxidation of the iron is likely to occur with the emission of short, fast sparks from the stream of molten iron.

4. After running out a few hundred pounds of iron for test, the tap hole is botted up and the heat proceeds as usual.

On the second and subsequent days this procedure should be repeated using a higher or lower bed as indicated by the first trial, but with all other variables in the cupola operation remaining unchanged. During the trials the bed height should be varied approximately four to 6 in. Recording the data from day to day permits easy comparison so that duplication of effort may be avoided.

If the first trial indicates a high (or low) bed, succeeding trials of higher (or lower) beds as the case may be, should be made until a satisfactory bed height is attained. Trials at this height should be continued for several days. Then, the bed should be raised or lowered and trials made, until the upper and lower bed height extremities and the optimum bed height are established.

Hold Constant for Trial Period

When the proper bed height has been determined, the metal and coke charge and the weight or volume of air should be held constant for a trial period. This should be done to check the bed performance. During this trial period, the temperature of the iron at the cupola spout should be determined with an optical pyrometer every 15 min. and recorded so the readings may be compared from day to day. If the bed gradually builds up to a height greater than the optimum, the temperature of the iron will fall and the melting rate, as shown by the size of the stream of iron, will decrease. If the bed gradually burns down to a height lower than the optimum, the temperature of the iron will be lower, the melting rate will increase slightly, and the iron will be oxidized to an extent shown by an increase in chill depth.

When the optimum bed height and the proper weight of the coke charge have been established, and the resulting cupola practice is producing an iron of the proper temperature and analysis, it is recommended that this bed height be established as standard. It should be maintained rigidly.

Maintaining Proper Bed Height. Determining the optimum bed height is one thing but maintaining the proper bed height throughout a day's heat is another. Many things can happen during an extended heat to change the bed height, and any change in bed height nearly always results in cold metal.

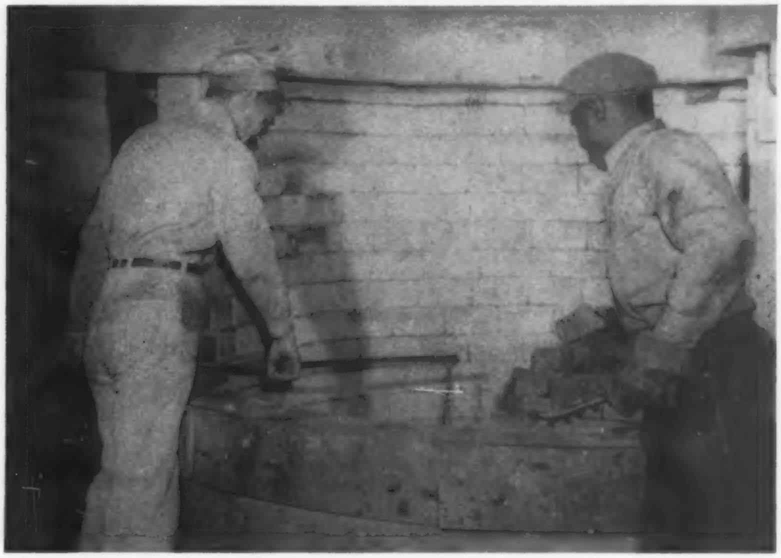
If the metal temperature falls during the heat, considerable damage may occur before an adjustment in the coke charge will register in increased metal temperature. Many operators charge a constant weight of air throughout an entire heat. (After all, the air is just as much a part of the cupola charge as the coke and metal.) This is desirable so long as the bed height remains within the desired operating limits.

Weight of Air Can Be Adjusted

Cold metal is nearly always the result of the bed height and air input becoming unbalanced, unless there is an obvious reason such as a shutdown. Fortunately, in most cases the weight of air can be adjusted to match any change in bed height, and the resulting effect will be an increase in the spout temperature within a few minutes.

Sometimes during the heat, an abnormal drop in metal temperature may occur, even though the correct bed height has been established and the proper weight of air is being charged through the tuyeres. If there has been no apparent reason for such a temperature change, the air input and bed height have become unbalanced. What is not known is whether the bed height is too low or too high. This can be determined by reducing the weight of air charged by five to 7 per cent. The tapping temperature of the metal will either increase or decrease depending upon the condition of the coke bed.

If the coke bed is too low the decreased air input will be followed within five minutes by an increase in metal temperature. If the bed is too high a further



Leveling bed by hand. Properly prepared and burned-in coke bed is one of most important phases of cupola operation. Poorly prepared bed can rarely be corrected during heat.

drop in metal temperature will occur. In this event, the air input should be increased five to 7 per cent above the normal supply. The temperature of the metal will then increase because of the faster burning rate of the coke. This procedure will avoid extended periods of cold metal and save many castings that would be scrapped otherwise.

While this blast adjustment will avoid cold metal, it is desirable to re-establish the normal melting rate to meet shop demands as soon as possible. To do this, the coke charge should be increased or decreased, as the case may be, enough to raise the bed from four to 6 in. As soon as the coke charge has had time to reach the operating bed, the air input should be adjusted to normal. With a continuous flow of metal at the spout and automatic air weight controls available, this means of control becomes very simple. In this connection, a recording optical pyrometer is valuable since the operator has a record of the spout metal temperature at all times.

Checking Performance of the Bed. Because of high temperature of the melting zone, the lining is eroded in a band several inches wide at the operating height of the coke bed. The bed performance can be checked by observing the extent of the cutting when the cupola is cold. In most cases this severely eroded band will be from 18 to 24 in. above the top of the main tuyeres. This height of coke is the height desired for the combustion zone.

The observant cupola operator will make daily notes of the refractory burnout sustained. These daily notes serve as an excellent guide to proper bed performance, and in many cases will give indications of melting irregularities that can be eliminated before they become serious enough to affect metal quality.

To check the performance of the coke bed during actual operation is not as simple as observing the eroded refractory band mentioned above, but there are several fundamental symptoms that indicate improper bed performance. These symptoms usually occur before any appreciable damage is done to the molten metal. The alert cupola operator will learn these symptoms and peculiarities of cupola melting and will make the necessary adjustments at once.

Probably the most apparent symptom of irregular bed performance is a sudden change in metal temperature without a noticeable reason. In most cases this sudden change is due to a low coke bed. The first indication will be a sudden rise in temperature followed within a few minutes by a gradual yet definite drop in metal temperature. This drop in temperature will continue until the air input and the operating bed height are put in balance again.

Slag Color Is a Factor

Slag color is another factor that can be used to determine bed performance. Normally acid cupola slags are a grayish green color when the air and bed height are in balance. A change to a dull black color indicates that the bed has fallen below its normal operating height. A very light green or cream colored slag indicates too much flux.

Excessive silicon and manganese loss together with low carbon pickup and sudden changes in melting rate are almost sure signs of improper bed performance. Chill tests caught regularly will be helpful in recognizing these changes. In any of the foregoing events the precautionary steps should be taken as soon as possible in an effort to eliminate erratic bed performance, which may cause cold or oxidized iron.

In each case of faulty bed performance the symptoms are similar and their remedy is simple to the alert well-trained operator. The addition or subtraction of coke is one method of correction, but the immediate correction is to adjust the air input as has been discussed.

The best asset any melting department can have is a conscientious supervisor who watches all necessary details and has the knowledge and intelligence needed to recognize minor variations and trends as they occur and is able to correct them before they become serious. The importance of careful supervision and planning in an effort to eliminate daily variations cannot be over emphasized.

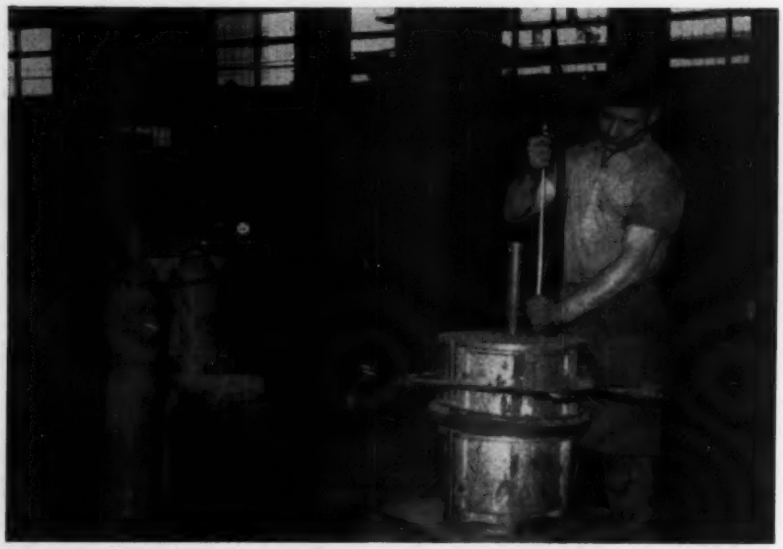


Fig. 1—Blowing carbon dioxide into freshly-rammed core.

Carbon Dioxide Process for 'Baking' Molds and Cores

Exposure of the molds or cores bonded with waterglass to carbon dioxide cuts hardening time to seconds or minutes. The process can be used under a licensing agreement. Original article, "Das Kohlensäure-Erstarrungsverfahren in der Giesserei," appeared in the December 24, 1953, issue of *Giesserei*. Hans J. Heine, AFS technical director, translated and adapted the article, supplementing it with additional information supplied by Dr. W. Schumacher, the author.

■ Commercially available special binders for the carbon dioxide "baking" process consist principally of waterglass. Waterglass, an alkali silicate, can be expressed by the chemical formula $Na_2SiO_3 \cdot xH_2O$ or $K_2SiO_3 \cdot xH_2O$. Since silicious acid is a very weak acid its salts can be wholly replaced by carbon dioxide, a process which takes place according to the equation:

$$Na_2SiO_3 \cdot xH_2O + CO_2 \rightarrow Na_2CO_3 \cdot xH_2O + SiO_2$$

Similar to the "kieselsinter" observed in the alkali silicate of Iceland's geysers through a reaction with carbon dioxide, the precipitated and amorphous silicious acid forms a silicious gel in the carbon dioxide hardening process. This solid skeleton of silica gel surrounds the sand particles and makes possible the hardening of the mold or core. Dry silica gels are, because of their cell-like structure, extremely porous and can have a surface area of approximately 13,700 sq. in. for a weight of 1 oz. Inasmuch as the reaction above is not reversible, it is not possible to soften molds or cores once they have been completely hardened.

It is likewise impossible to reharden molds or cores through renewed exposure to carbon dioxide, if they have inadvertently become water-logged and soft subsequent to the initial hardening process. The addition of excess water causes solution of sodium carbonate as well as the gradual formation of a colloid of the composition Si $(OH)_x$. This colloid likewise cannot be hardened by a further addition of carbon dioxide. Therefore, attention should be given to a judicious addition of water to any subsequently used mold or core wash.

Super-saturation with CO_2 Observed

At the point of entry of the carbon dioxide into the mold, a super-saturation with CO_2 has been observed by the appearance of white spots. On the other hand, the transformation into silicious acid does not proceed completely at locations relatively remote from the point of entry of the carbon dioxide. The blowholes should, therefore, be located so that blowing time does not have to be unduly long. The proper location has to be worked out experimentally.

The hydrate water in the binder will form steam on contact with liquid metal. Since the quantities of water vapor thus formed are large, molds and cores have to be vented carefully.

Transformation of alkali silicates by carbon dioxide causes an increase in volume when passing from the

liquid to the solid state. Patterns and core boxes, therefore, should have the usual draft, lest the removal of the pattern from the hardened mold, or the opening of the core box cause cracks. Moreover, the cores and molds should not be rammed too hard. Again, this will have to be worked out experimentally.

When the liquid metal rises in the mold during pouring, it can be observed that freezing takes place very rapidly along the walls of the mold or the core. This rapid transition from liquid to solid appears to make any chemical reaction at the interface between the molding material and the liquid metal impossible. For instance, no desulphurization should take place as the result of a reaction between sodium carbonate and sulphur in the case of gray iron. If there should be reactions of a short duration in the surface of the casting, no analytical proof of any chemical modification of the gray iron has been found to date in spite of painstaking investigations.

The raw materials for molding and core making according to this novel German process are dry silica sand, bituminous binder, a special binder containing sodium silicate, and carbon dioxide. The mixture, made up in a conventional mixer by thorough mulling has the following composition: 100 lb silica sand, 5 lb special binder containing waterglass, and 1 lb bituminous binder. Instead of the dry silica sand, dry chamotte can be used, depending upon the wall thickness of the casting and the metal to be cast. The grain fineness should not be coarse, inasmuch as rounding of the edges subsequent to hardening may cause difficulty; spalling of large areas has been encountered and causes the production of dirty castings.

Sand Should Be Lightly Pressed

For the preparation of cores, the sand should be lightly pressed or rammed into the core box. In most cases core rods will not be necessary. It will be sufficient to provide for a hook for subsequent handling. The use of coke for venting is likewise not generally necessary, but economic considerations may make it desirable in preference to other methods using more costly special sands. After the core box is filled and struck off, the cores can be taken out in the conventional manner.

Once the core box has been filled, a chrome-plated "punch bar" is used to make holes of $\frac{7}{64}$ to $\frac{13}{64}$ in. in diameter, spaced 4 to 5 in. apart. Carbon dioxide is blown into these holes through a special orifice under 2 to 4 atmospheres pressure. The orifice has 12 small apertures at its lower end. On blowing, it is important that the first carbon dioxide to enter the core box should be directed to the bottom portions of the sand and the blow pipe then gradually pulled upwards until the hardening can be felt at the top surface of the core. Depending upon the size of a core, this hardening process will be a matter of seconds or minutes. Immediately upon completion of the chemical reaction, cores can be handled. Any sticking noticed is an indication of insufficient blowing time.

Depending upon the size of the cores and the metal used, the hardened cores can be coated with a core wash and immediately placed in molds or painted with a special slurry which will dry in a short time. In the case of large cores, it may be preferable to bake

Fig. 2—Core for steel casting after hardening by carbon dioxide. Dimensions of top face are 47 x 55 in.

at 400 F for a short time after the core wash has been applied. Repairs can be made with a special sand mixture and again treated with carbon dioxide.

Figure 1 shows the simple procedure followed when blowing carbon dioxide into the core. A cart is used to transport the carbon dioxide bottles, and the amount of CO_2 can be regulated while the molder tests the core hardness. A hardened core can be noticed in the front part of the picture. To determine the properties of the sand as well as the hardening time necessary, several test cores can be made by ramming in a predetermined manner and hardening for varying periods of time. Average values of permeability, shear strength and compressive strength are shown in Table 1.

As could be expected, permeability is influenced very little by the carbon dioxide treatment. On the other hand, only very short exposures will increase shear and compressive strengths markedly. The experiment definitely shows that a core treated for only 15 seconds is hard enough to be inserted into the mold.

Composition Is the Same

The carbon dioxide hardening process is applicable with equal success to molds for gray iron or steel castings. The composition of the molding sand mixture is the same as that used for cores. It is applied as a facing on the pattern; a layer $1\frac{1}{4}$ to 2 in. in thickness will suffice. Since the mold will be hardened prior to pulling of the pattern, sprue, runner and gate should be made of wood and placed into the drag. These parts will also be faced with a layer of hardenable special molding sand. Then the flask can be filled with

TABLE 1—CORE PROPERTIES AS A FUNCTION OF HARDENING TIME

Carbon Dioxide Treatment, Sec.	Permeability	Shear Strength, psi	Compressive Strength, psi
Begin	150	0.57	1.56
1	170	0.85	1.56
2	170	0.85	1.70
5	170	0.99	1.99
10	170	2.56	3.70
15	175	11.0	30.6
20	182	26.5	46.2

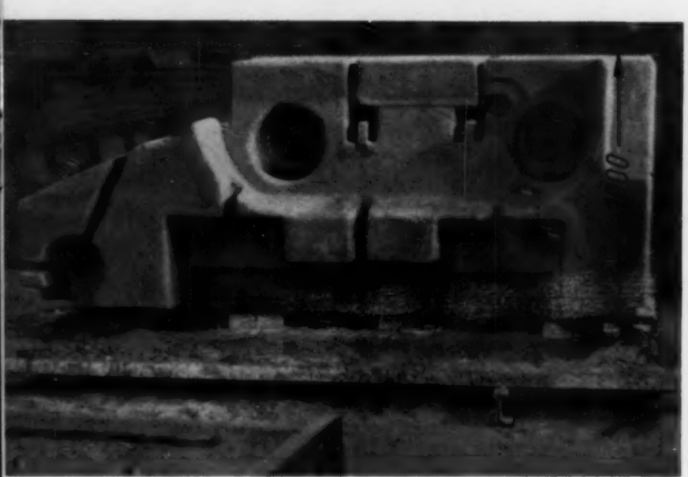


Fig. 3—CO_2-hardened core for 4-ton steel casting. Height of the casting measures 39 in.

Fig. 4—CO_2-treated core for steel casting, prepared for core wash operation.

backing sand in the conventional manner. After the mold has been slicked off, holes have to be punched in a manner similar to that described above for cores. They should be $^{7}/_{64}$ to $^{13}/_{64}$ in. in diameter, equidistantly spaced at about 4 to 5 in. When the blowing of carbon dioxide is begun, special care should be taken to insure that the pipe penetrates the pattern initially. Subsequent to hardening, the blow-holes should be closed with the special sand and lightly hardened with carbon dioxide.

The cope is made in a manner similar to that described for the drag. Then the cope is removed, the pattern lifted, and the mold is ready to be closed and poured off. Inasmuch as the hardening of the mold takes place while the pattern is still imbedded in sand, rapping is impossible. It becomes, therefore, of the utmost importance to make sufficient allowance for draft on the pattern. For this reason, cylindrical shapes cast horizontally are specially adapted to this process.

Contains 30 Per Cent Chamotte

Figure 2 shows a core for a steel casting weighing about $2\frac{1}{4}$ tons. The raw material for this mixture is composed of 70 per cent clay-free silica sand and 30 per cent chamotte. The blowholes are clearly visible. The hardening time necessary was only 120 seconds. The hardened core was washed with blacking and dried for two hours at approximately 400 F.

Figure 3 shows a core for a steel casting weighing 4 tons. The core weighs approximately $3\frac{1}{2}$ tons, was completely hardened in 15 minutes, and was usable immediately without further treatment. The casting was absolutely free from imperfections.

Figure 4 shows a core which was coated with a mixture containing iron oxide and dextrine and subsequently air-dried. No skin drying was necessary for the mold.

It was especially noted that the metal runs very quietly over the cores and that no blows are encountered. No scabs have been observed and no increase in cleaning time was recorded for any of the experimentally produced castings. The cores could be readily removed.

Figure 5 shows a mold hardened for gray iron. The casting weighed approximately 330 lb and showed a markedly improved surface appearance over conventionally dried molds. Dimensional tolerances, too, were closer.

An evaluation of the economic feasibility of the modified drying process showed it to be cheaper and far less time-consuming. The amortization of the carbon dioxide apparatus and auxiliary equipment can be neglected because of their small dollar values. The German investigator claimed an overall savings of approximately 20 per cent in favor of the carbon dioxide hardening process. In addition to the economic advantages, other desirable features are claimed, particularly for the manufacture of high production items where core blowers are usually employed.

No need for core driers was found even when intricate, heavy dry sand cores were replaced with cores made by the new process. It has been found possible to add carbon dioxide to the air used in core blowers so that the core will harden on blowing. The only precaution which must always be observed is to insure sufficient blowing time to permit the CO_2 to complete the reaction with sodium silicate.

In pouring off molds containing dry sand cores, obnoxious fumes are often encountered. This is minimized with the carbon dioxide hardening process, since the cores contain only very small amounts of bituminous binder which is combustible. This results in the evolution of some smoke, but it changes into water vapor rapidly.

Since one quart of water will, upon vaporizing, occupy 1675 quarts of space, cores dried with carbon dioxide have to be vented especially well. If this is not done, the steam will escape through, or be entrapped by, the molten metal.

Due to the rapid hardening of the cores, production can be vastly increased, and in cases where there was a need for several core boxes for the conventional core-making process, one may be sufficient for the carbon dioxide hardening process. Permeability and other mechanical properties of CO_2-treated molds and cores were found to be quite comparable with corresponding values obtained on conventional sands.

No cases have been observed where hardening of

the heap sand mixture took place because of the carbon dioxide content of the atmospheric air. It is suggested that prepared mixtures be covered with a moist rag over night to prevent drying out.

Advantage Claimed Is Dimensional Accuracy

A special advantage claimed for the process is dimensional accuracy of cores. A conventionally prepared core is usually removed from the core box immediately after it is blown or rammed. Since it is in a soft and plastic state, dimensional changes may be encountered, especially at shoulders and vertical walls. This is accentuated in subsequent drying in an oven. Since cores made by the carbon dioxide hardening process are hardened in the core box, close dimensional tolerances are insured, because the core is not removed from the box until it is hard and no longer subject to undesirable deformation by handling and transportation.

Because of the high mechanical properties of cores, the possibility of hot tearing was suggested. However, this tendency is counteracted through the combustion of the bituminous binder during pouring, with subsequent loosening of the hardened core. If careful attention is paid to all details of the operation, no hot tearing should be encountered. The assumption that cleaning is made more difficult was also proven to be incorrect. A correct amount of bituminous binder will solve this problem also. Standard times, definitely established for conventional molding, can be strictly adhered to when using the carbon dioxide method.

Fig. 5—This CO_2-treated mold will be used for the pouring of gray iron castings.

The use of carbon dioxide causes some difficulty in the winter, when the temperature of the ambient air decreases. The pressure gage of the carbon dioxide bottle should be electrically heated and the bottle kept in a warm room, though not above 100 F. However, it is paramount that the carbon dioxide be free from water.

Calendar of Future Meetings and Exhibits

September

6-14. . The Institute of Metals (British)
Zurich, Switzerland. 46th Annual Autumn Meeting.

13-25. . First International Instrument Congress & Exposition
Philadelphia Convention Hall, Philadelphia.

16-17. . American Hot Dip Galvanizers Association
Hotel Dennis, Atlantic City, N. J. Semi-annual Meeting.

19-26. . International Foundry Congress
Florence, Italy. Host: A[illegible]zione Italiana di Metallurgia.

21-23. . Society for Experimental Stress Analysis
In conjunction with first International Instrument Congress and Exposition. Bellevue-Stratford Hotel, Philadelphia. Annual Meeting and Exposition.

27-28. . Steel Founders' Society of America
The Greenbrier, White Sulphur Springs, W. Va. Fall Meeting.

28-30. . Society of Industrial Packaging and Materials Handling Engineers
Chicago Coliseum, Chicago. Ninth Annual National Industrial Packaging & Materials Handling Exposition.

28-Oct. 1. . Association of Iron and Steel Engineers
Cleveland Public Auditorium. Iron and Steel Exposition.

October

6-8. . National Foundry Association
La Salle Hotel, Chicago. 56th Annual Meeting.

14-15. . Michigan Regional Foundry Conference
University of Michigan, Ann Arbor, Mich. Sponsored by AFS Central Michigan, Western Michigan, Saginaw Valley, Michigan State College, and University of Michigan Chapters.

14-16. . Foundry Equipment Manufacturers' Association
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

15-16. . Northwest Regional Foundry Conference
Hotel Vancouver, Vancouver, B. C., Can. Sponsored by AFS Washington, Oregon, British Columbia, and University of Oregon Chapters.

16-19. . Conveyor Equipment and Manufacturers' Assn.
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

18-22. . National Safety Council
Conrad Hilton Hotel, Chicago. National Safety Congress and Exposition.

21-22. . Fifth Annual National Noise Abatement Symposium
Illinois Institute of Technology campus, Chicago.

27-29. . Grinding Wheel Institute & Abrasive Grain Association
Edgewater Beach Hotel, Chicago. Fall Meeting.

28-29. . Purdue Metals Casting Conference
Purdue University, Lafayette, Ind. Sponsored by Central Indiana and Michiana Chapters of AFS and Purdue University.

28-30. . All-Candian Regional Foundry Conference
King Edward Hotel, Toronto, Ont., Can. Sponsored by AFS Eastern Canada and Ontario Chapters.

29-30. . New England Regional Foundry Conference
Massachusetts Institute of Technology, Cambridge, Mass. Sponsored by New England Foundrymen's Association and M.I.T.

29-Nov. 5. . American Society for Metals
Palmer House, Chicago. 36th National Metal Congress.

November

1-5. . American Society for Metals
International Amphitheater, Chicago. National Metal Exposition.

Statistical Quality Control for the Foundryman

Ross Martin, Jr. / *Works Manager, Glamorgan Pipe & Foundry Co., Lynchburg, Va.*

Quality control by means of statistical methods is much simpler and easier than many foundrymen not profiting by their use believe.

■ Quality control is not new, but, statistical quality control is a relatively new technique.

Quality control probably first came into being with man's first attempt to improve on nature. It may have been that when the first cave man sought to improve the properties of a natural stone ax by chipping or breaking off portions of the stone, he instituted a crude form of quality control. Since that time and until just before the turn of the century, quality control concerned itself with (1) the developing of highly skilled craftsmen to produce a product inherently high in quality and (2) employing competent inspectors to separate the good from the bad.

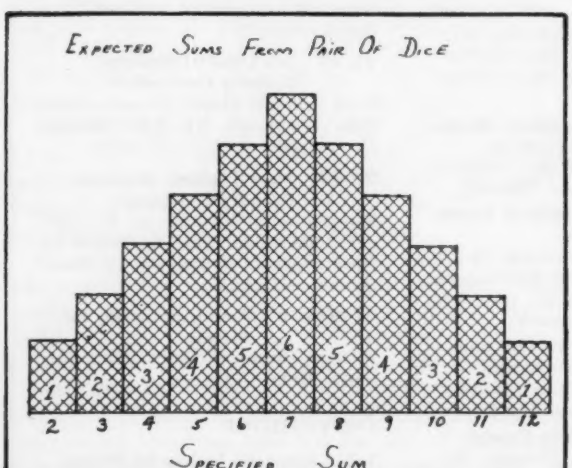


Fig. 1—These data are shaped like normal curve.

The development of highly skilled craftsmen does not fit into a scheme of high productivity built on mass production and the use of semi-skilled production workers. It is an all too familiar fallacy that an inspector can accurately separate the good from the bad. It has been rather conclusively proven that a so-called 100 per cent inspection is really, at best, not more than an 80 per cent inspection. Because of the inherent human weaknesses imposed on a manual inspection operation, some bad pieces are going to be allowed to go out with the good and some good pieces will go out with the rejects. Some so-called 100 per cent inspections are better than others, but the best is not perfect, otherwise there would be no customer complaints.

Statistical quality control is a technique or a tool that has been developed to enable one to make better decisions in producing a product at a higher quality level. It also provides a measuring stick for measuring the elusive attribute called quality. Statistical quality control had its beginning early in 1922 when Walter Shewhart of the Bell Telephone Laboratories began a series of control charts on certain of the products manufactured by the Western Electric Co., the manufacturing division of the Bell Telephone System. His charts and all the techniques used today are based on the statistical theory of chance occurrences.

Has a Firm Mathematical Foundation

Thus, statistical quality control is not a lot of hocus pocus but has a firm mathematical foundation. However, to use the technique a broad mathematical background is not necessary. Anyone capable of multiplying, adding, dividing, and subtracting will be able profitably to apply statistical quality control. Certain formulas must be used and as long as they are accepted it is not necessary to understand their derivation.

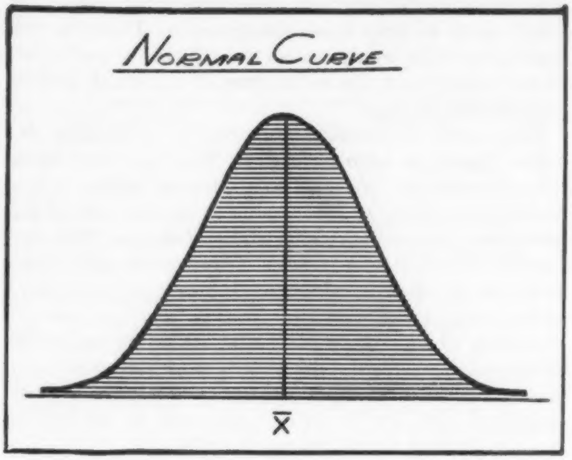


Fig. 2—A normal distribution curve.

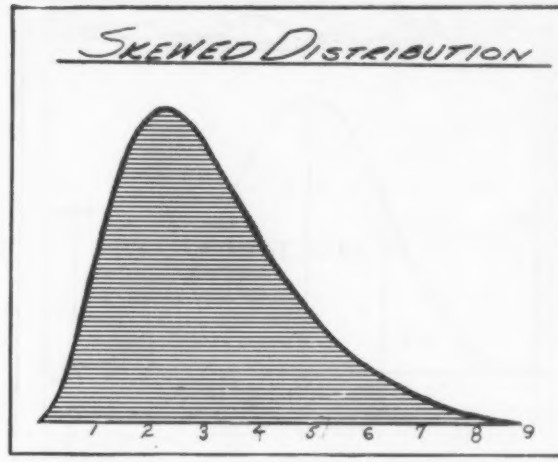


Fig. 3—Curve with skewed distribution.

These formulas are mathematically correct and have been proven in many applications.

One concept that must be thoroughly understood and accepted as a foundation for a discussion or application of statistical quality control is the concept of variation. Everything varies. This is true of materials, men, and machines. No two objects occurring in nature or produced by man are exactly alike if measured precisely enough. A 12-in. rule such as might be purchased in an assortment of school supplies for the elementary grades probably will be accurate to the nearest 1/16 of an inch. But, if measured to 1/1000 or 1/10,000 of an inch, considerable variation in the length of a supposedly 12-in. rule would be found. If a large number of these rules were measured it is expected that more rules would be nearly exactly 12-in. long and relatively few of them would be off by any considerable margin.

The 12-in. rule is only one example of variation. Everything manufactured will vary; there is a variation in dimensions of pipe, fittings, coke, brick, shells, or anything else. For a specific example, take five items of a product being manufactured. Assume that production is approximately 1000 of these items per shift. Of this sample of five items, two are bad and three are good. What does this mean? What conclusions can be drawn regarding the quality of the remaining 995 items from information received from this sample of five?

Only Two Bad Items Picked Out

It might be assumed that the only two bad items in the lot of 1000 or the only three good items had been picked out. Then scrap based on this sample is somewhere between 0.2 per cent and 99.8 per cent. The chance of either of these extremes being true is very small. What needs to be known is: what is the chance of either of these two extremes being true? How many of the items have to be sampled to give good odds in making a decision as to the quality of the remaining items?

Statistical quality control can provide the answer. It can be applied to everything that varies in the universe and its applications are limited only by a

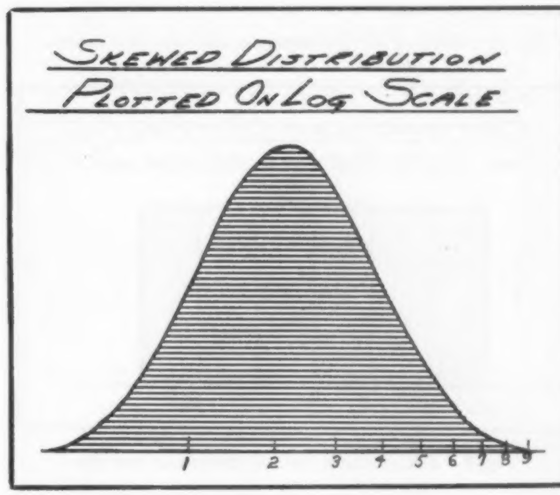


Fig. 4—Replotted data approaches normal curve.

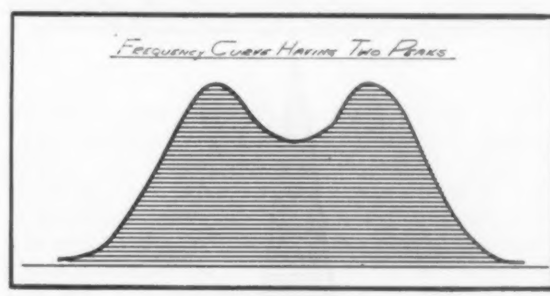


Fig. 5—Superimposition of two normal curves.

person's imagination and knowledge. Despite this, it is common for an individual to say: "Statistical quality control cannot be applied in my plant, though it might be good for someone else."

One might surmise that the first work in mathematics of probability was prompted by games of chance. A French gambler living during the 17th century wanted to know in advance what the odds would be on certain games of chance and how he should place his bets so that he would always be sure

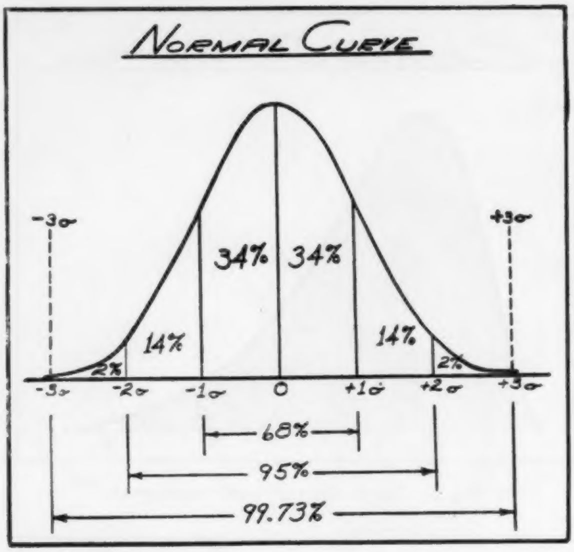


Fig. 6—RMS of deviations from average as a curve.

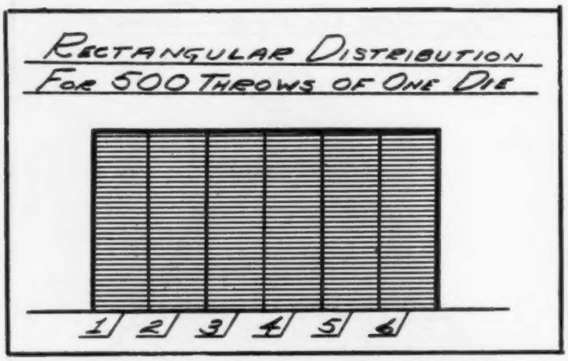


Fig. 7—Distribution for 500 throws of one die.

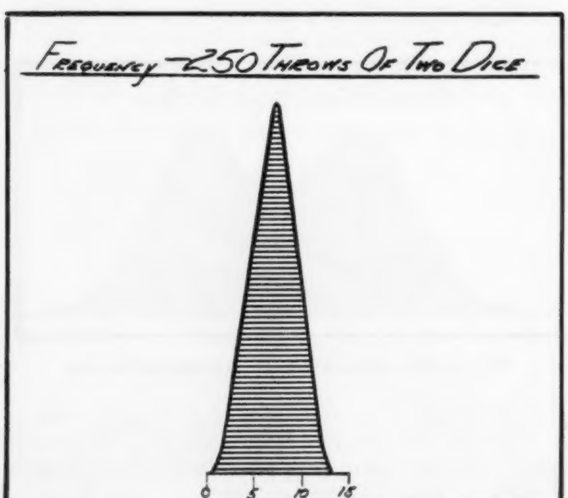


Fig. 8—Frequency distribution for 250 throws of two dice is not rectangular, begins to follow normal distribution.

Fig. 9 (right)—Typical X-bar-R chart.

of winning in the long run. The mathematicians were called upon to help solve the problem. This was the beginning of the mathematics of probability and is the source from which the techniques of statistical quality control were derived.

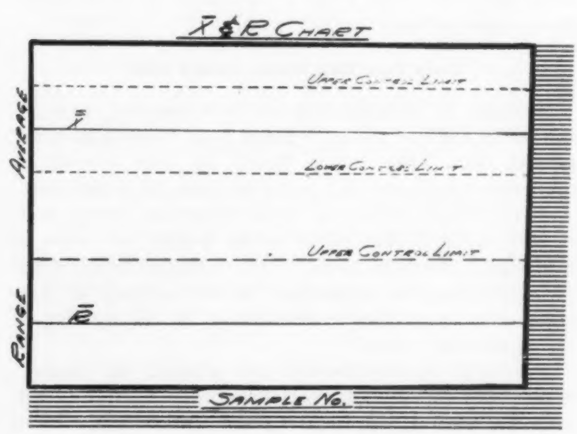
Two kinds of mistakes are possible in making decisions based on numerical data. The first is to draw a conclusion and to take some action which is not justified by the data. The second is to miss something from the data which is actually there so that the correct action is not taken. Adjustments are often made on insufficient evidence. One or two pieces may be measured and the process level is raised or lowered according to how these particular items are measured as individuals. When a decision is made on such a few pieces, a process which is already perfectly set may be tampered with and it will be adjusted in the wrong amount or even in the wrong direction.

One basically true theorem is: "Whenever one adjusts a process on insufficient evidence, product quality will be more variable than necessary and with more material out of specification than necessary." The application of the techniques of statistical quality control tell what risks are being taken in making a wrong decision and these risks can be controlled within whatever limits are desired.

Two Causes of Variation Possible

Returning to the question of variation, it is known that there can be two causes of variation. One is a random variation. For example, in rolling dice the number seven would appear more frequently as the sum of the numbers on the two dice than any other sum. Figure 1 shows the number of times certain sums would be expected from rolling a pair of dice. This variation is called a random variation or in terms of the mathematician, it is a variation caused by a system of chance causes. If this is the only type of variation that exists in a process, it is going as well as can be expected. The only way that it can be improved is to improve the method.

The other type of variation is assignable. It may be that the tool is dull . . . the scales are not balanced . . . the mold is soft rammed . . . a bearing is worn . . . the wrong type of raw materials was used. Any of these things will cause a variation in the finished product but this variation is not due to chance causes,



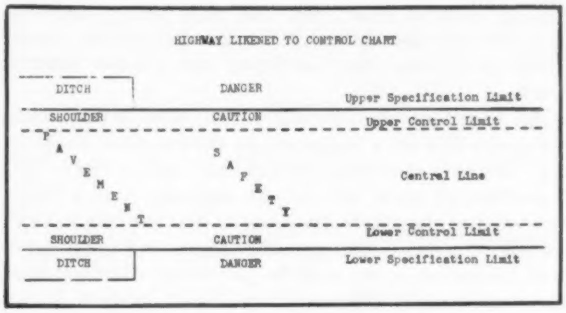


Fig. 10—Highway pavement analogy.

it is due to a specific reason and is referred to as an assignable cause or a variation caused by a specific or unusual condition. This is the type of variation the foundryman likes to eliminate from his process.

In eliminating the mavericks, or assignable variations, it must be remembered at all times that there will always be random variations to confuse the picture. Statistical quality control will enable one to separate the variations in a product that are caused by specific correctable reasons from the random variations that are normal and to be expected.

Tend to Approach Normal

A normal distribution curve is shown in Fig. 2. If a sufficient number of thicknesses, weights, etc., is measured as they occur in nature or as manufactured, they will all tend to approach this normal distribution curve. The data in Fig. 1 is shaped like the normal curve. There are some skewed distributions as in Fig. 3. Many of these, if plotted on a different scale, can be made to approach the normal distribution curve (Fig. 4). A frequency distribution that quite often occurs in the manufacturing industry when normal curves are superimposed upon each other appears in Fig. 5.

It is necessary to have a measure of variation. The standard deviation is the scale used by statisticians to measure variability. It is usually denoted by the Greek letter σ. Mathematically it is the root-mean-square of the deviations from the mean or average. This is the measuring stick for variability; the normal distribution curve (Fig. 6) shows what it measures.

A band of one sigma from the mean covers 34 per cent of the items. A band of plus and minus one sigma covers 68 per cent. A band of plus and minus two sigma will contain 95 per cent. And 99.73 per cent will be contained within plus and minus three sigma limits. Plus and minus three sigma limits are used in most applications of statistical quality control charts. However, there are applications where plus and minus two sigma limits have been employed. Limits of plus and minus three sigma means that the odds of making an erroneous decision are 27 out of 10,000. Decisions based on these odds will be right 99.73 per cent of the time.

In practice, averages of a group of readings usually are used rather than an individual reading. A distribution of averages will more closely approach the normal theoretical distribution curve than will the distribution curve for individuals. This can be easily

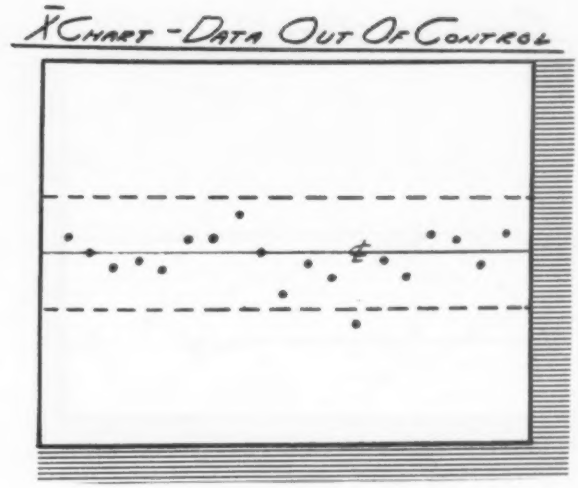


Fig. 11—Typical X-bar chart.

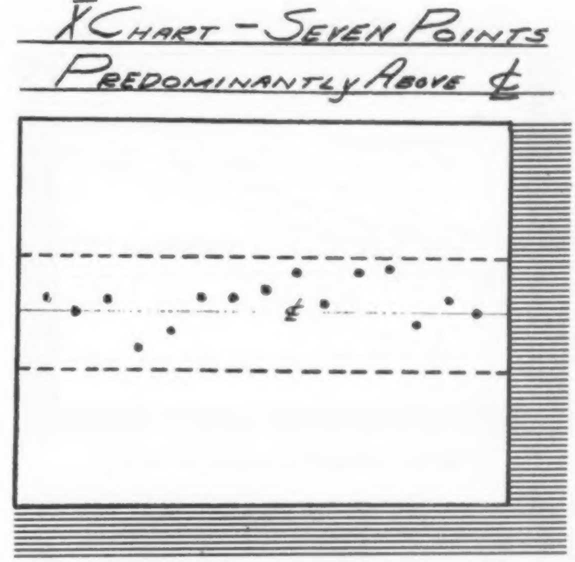


Fig. 12—Seven points above X-bar or central line shows that the process has changed.

shown. Suppose one die is thrown 500 times resulting in the frequency distribution curve in Fig. 7. Note that this is a far cry from the bell-shaped or normal distribution curve. This is a rectangular distribution and is man-made. Suppose, however, two dice are rolled 250 times and a frequency distribution of the sum of the two numbers appearing on the top face of each die is made. This frequency distribution (Fig. 8) is no longer rectangular but definitely begins to follow the normal distribution. The greater the sample size the more nearly normal the frequency distribution will be.

Four Items in Sample Taken

In usual practice, averages of four or more items in a particular sample are taken and even if the frequency sample of distributions should be rectangular, which is the most extreme exception, the distribution of the average of four or five samples will be quite close to the normal distribution curve. It is from the

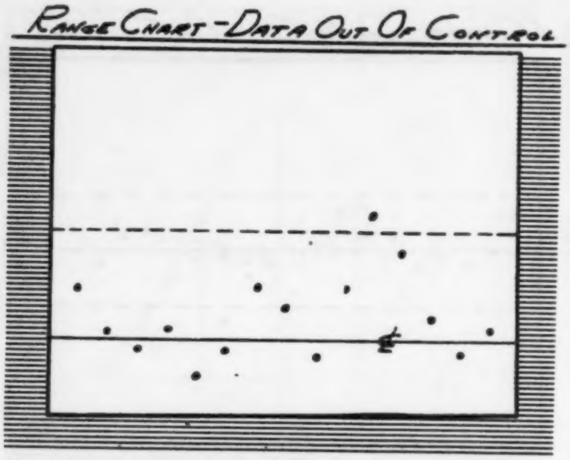


Fig. 13—Point outside control limits of range chart denotes change in variation.

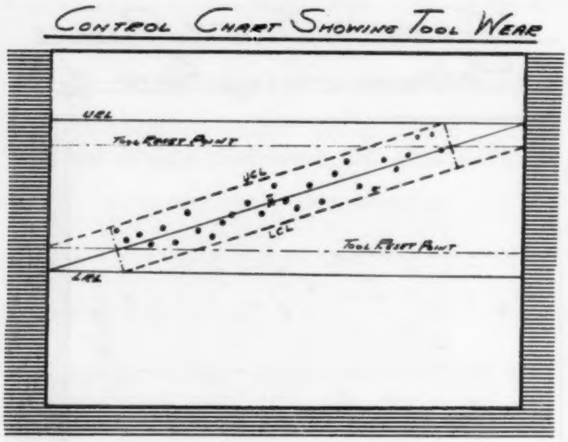


Fig. 14—X-bar-R chart for tool wear.

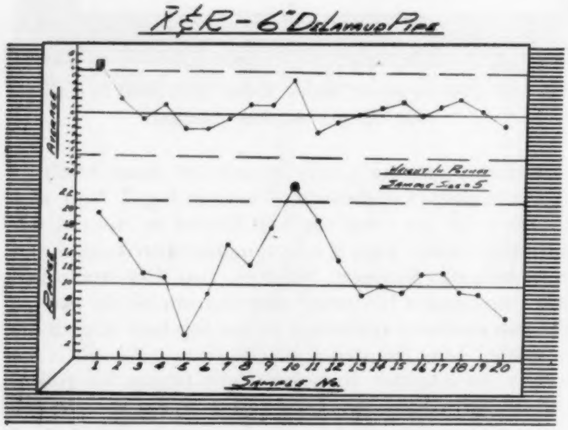


Fig. 15—X-bar-R chart for 6-in. De Lavaud pipe.

normal distribution curve of samples averages that the formulas were derived in computing the statistical limits.

The most common type of control chart is referred to as the X-bar-R chart. The X-bar ($\overline{X}$) means that the average of a certain number of samples has been taken from the product or process. Figure 9 is a typical X-bar-R chart. For the time being, consider only the top part of the X-bar portion of the chart. There is a center line, an upper, and a lower control limit.

An excellent analogy which has been widely used compares this to a highway. As shown more fully in Fig. 10, the pavement is the safe area. There are shoulders on each side of the highway and a ditch beyond the shoulders. As long as the product is kept on the pavement—between the upper and lower control limits—no scrap will be produced. Getting into the area outside the upper and lower control limits but within the specification limits means the process is out of control and will produce scrap if some adjustment or action is not taken. Exceeding the specification limits on either side definitely means scrap is being produced.

First, always determine if the control limits will lie within the specification limits. Unless this is true, control is impossible. If control limits are outside specification limits, all that can be done is to go ahead, knowing that scrap is being produced and attempting to sort the good from the bad by 100 per cent inspection.

Shift the Process Setting

The simplest interpretation of an X-bar chart (Fig. 11) is to shift the process setting or look for trouble when a point occurs outside the control limits—either the upper or the lower. A more refined technique is to watch for runs as well. When seven points in a row (Fig. 12) are either above or below the X-bar or central line, the process has changed. The process can change either by a shift in average and/or a shift in variation. A run denotes a reduction in variation or a lower standard deviation as well as a shift in the average either upward or downward.

The bottom portion of the X-bar-R chart (Fig. 9), the range chart, must be used in addition to the upper portion in order to interpret a process properly. The range is the numerical difference between the minimum and maximum values in the sample. The lower limit of the range chart is usually zero unless there is a very large sample size, in which case it will have a real value. If a point occurs outside of the control limits of the range chart (Fig. 13), action should be taken as it denotes there has been a change in the variation of the process.

A special application of the X-bar-R chart is one used for tool wear (Fig. 14) in which the control limits are set at an angle instead of being horizontal. This type of chart will enable one to pick the proper time to change the tool setting or to regrind the tool in order to obtain the greatest tool economy without producing rejects. Typical X-bar-R charts are shown in Fig. 15-18 illustrating control data for various operations in the author's plant. The control limits for all of these charts are obtained by substituting the proper average range and sample average in the formulas as shown in Fig. 19.

In addition to the X-bar-R chart, a fraction defective or per cent scrap chart is used to control certain quality characteristics which are not subject to abstract measurement. For example, in the foundry there are sand holes, blows, poured short, cold runs,

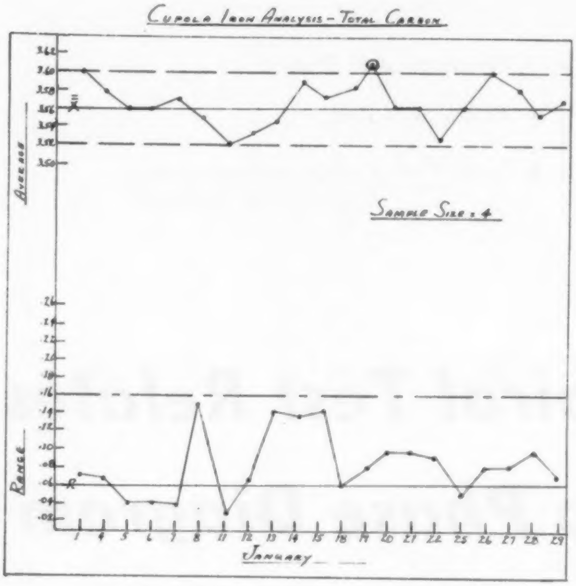


Fig. 16—X-bar-R chart for total carbon.

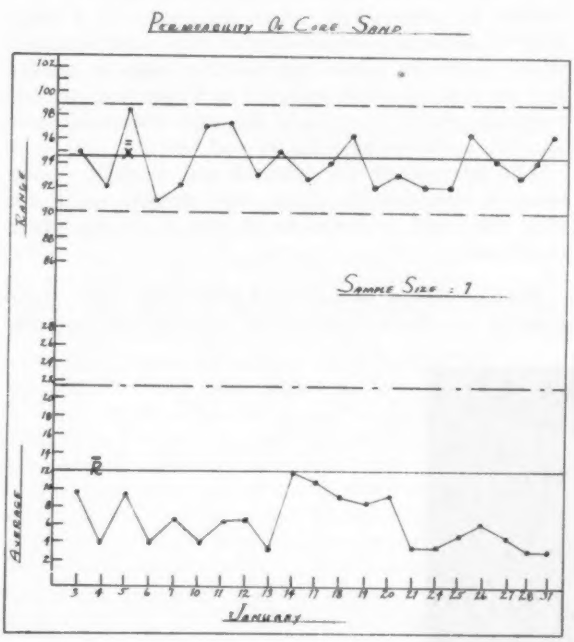


Fig. 17—Chart for permeability of core sand.

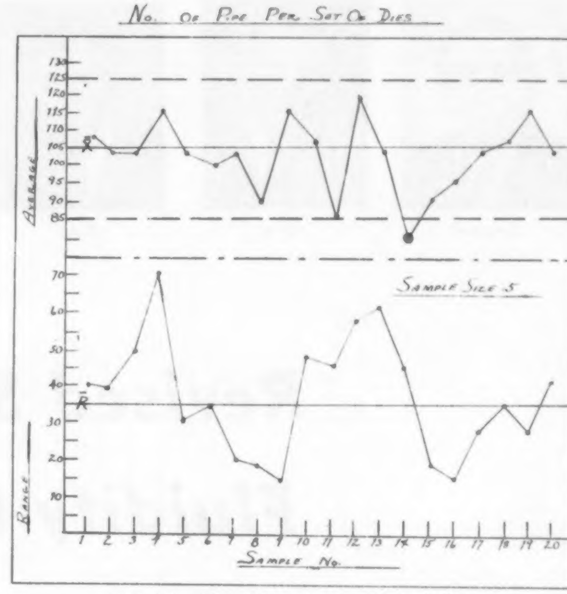


Fig. 18—Chart for pipe per set of dies.

Control Limits For $\bar{X}$ & R Charts

Upper Control Limit For $\bar{X} = \bar{\bar{X}} + A_2 \bar{R}$

Lower Control Limit For $\bar{X} = \bar{\bar{X}} - A_2 \bar{R}$

Upper Control Limit For $R = d_4 \bar{R}$

Lower Control Limit For $R = d_3 \bar{R}$

Fig. 19—Control limits for X-bar-R charts.

Control Limits For p Charts

Upper Control Limit $= \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{N}}$

Lower Control Limit $= \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{N}}$

Fig. 20—Formulas for p-chart calculations.

cracked castings, omitted cores, etc. Other industries will have typical defects. Even offices will have quality variations such as the number of typographical errors in a written letter, or number of errors made in a shipment or a bill of lading.

The control chart for measuring fraction defective is similar to the X-bar-R chart. In a fraction defective chart there is a lower control limit as well as an upper control limit. This means that there is equally as good a reason for producing a heat or batch of material which has much lower scrap than would normally be expected as there is for producing one which contains more scrap than would be expected.

The lower scrap is as much of a signal for action as the higher scrap. It could be that because of improper inspection the customer is actually receiving a scrap product or it may be that the process has changed in some respect so that it is possible to produce a product at a lower scrap level. In the latter case, it is important to find out why so that the method can be duplicated in the future.

Control limits for p-charts are calculated by the formulas in Fig. 20 in which p is the fraction defective in combined samples under consideration, expressed as a decimal instead of per cent, and N is the number of units in the sample.

This by no means represents the full scope of statistical quality control. More is given in the AFS book entitled Statistical Quality Control for Foundries.

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Revised Spiral Test Relates Fluidity to Phase Diagram

A simplified, reproducible fluidity spiral design—independent of pouring technique—measures metal flow and shows how fluidity of alloys ranging from gray iron to lead is related to the value of the pouring temperature above the liquidus.

■ Fluidity testing has received fully as much attention as any other foundry variable. This is because it is imperative to pour a given alloy in a temperature range bounded on the low side by excessive scrap resulting from misruns, seams and cold shut and on the high side by scrap caused by burnt-on sand, metal penetration, and large grain size.

It is well understood among foundrymen that fluidity here does not mean the reciprocal of viscosity as defined in physics but rather the ability of a given ladle of metal at a certain temperature to fill a certain mold. Naturally, some quantitative index is needed and the fluidity spiral designed by Saeger and Ash has received general acceptance although requiring modification as shown by Schaefer and Mott.[1]

The purpose of this research was twofold: to develop a reproducible green sand fluidity spiral for shop use, and to correlate fluidity with the phase diagram.

Fluidity Spiral Design. Schaefer and Mott have pointed out the two principal variables affecting the

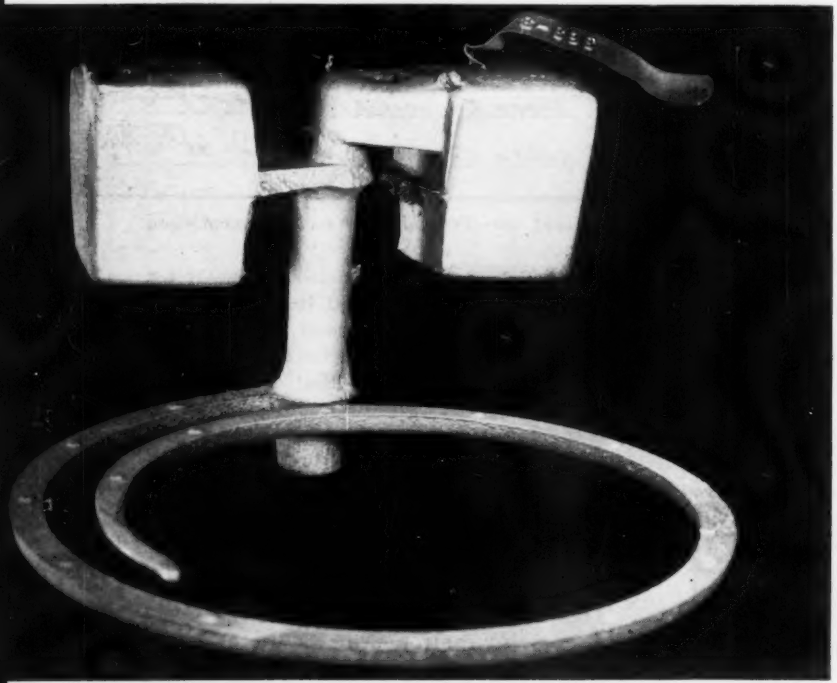

Fig. 1—Redesigned fluidity spiral gives high reproducibility. Work of Schaefer and Mott was modified, with somewhat smaller basins. Because of excellent reproducibility, and to conserve metal, only one spiral was poured.

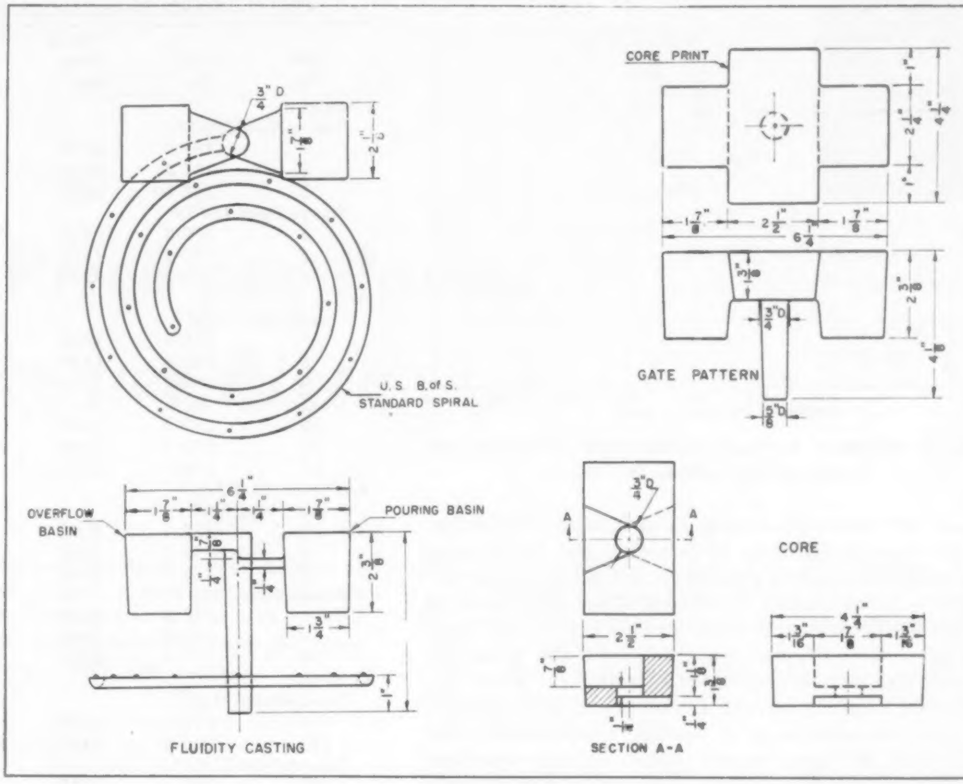

Fig. 2—Fluidity spiral drawing, showing built-in pouring control devised by authors.

reproducibility and accuracy of fluidity data: (1) design of the pouring basin and downsprue, and (2) temperature measurement.

Previous investigations[2] refer to the need for an experienced operator to obtain reproducible results in any one day. Day to day variations could be considerable because the operator could observe the time at which the mold was being filled and vary the pouring rate; also cold metal pellets could bounce into the downsprue ahead of the main stream. Schaefer and Mott designed a core assembly mold consisting of a large pouring basin with a ¼-in. high orifice hidden at the top. The pourer could therefore establish a wide pouring stream to the basin before the hidden orifice was reached. The head represented by the top of the orifice could not be exceeded since an overflow basin was provided slightly above the top of the orifice.

Needs Careful Core Assembly

This procedure required rather careful core assembly technique and the green sand mold with simple core inserts (Fig. 2) has been designed for the present investigation. The basins are not quite as large as those in the Schaefer and Mott design and only one spiral is poured to conserve metal since the reproducibility is excellent. Temperature measurements can be taken either in the pouring basin with a butt-welded 28-gage thermocouple in a ⅛-in. silica tube, or optically, at pouring. An example of reproducibility under everyday conditions is shown in Table 1. In general, when allowances are made for differences in pouring temperature, as discussed in the next section, the reproducibility is about 2 in. of spiral length.

TABLE 1—REPRODUCIBILITY OF FLUIDITY SPIRAL SHELL VS. GREEN SAND MOLDS

Cstg. No.	Pouring Temp. deg. F.	Deg. Above Liquidus*	Mold Material	Spiral Length inches
395-2	2600	465	green sand	50.5
395-3	2610	475	shell	52
395-4	2605	470	green sand	50
395-5	2600	465	shell	47
395-6	2590	455	green sand	46
395-7	2540	405	green sand	40.5
395-8	2520	385	shell	44.5
395-9	2510	375	green sand	41
395-10	2390	255	green sand	26
395-11	2380	245	green sand	27
395-12	2370	235	shell	29.5
395-13	2350	215	green sand	24

*First Tap—Liquidus 2135 F

Shell molded spirals were made to evaluate the claims of greater fluidity of metal poured in shell molds. A consistent increase of 2-4 in. was obtained as shown in Table 2.

Fluidity and the Phase Diagram. Schaefer and Mott pointed out clearly the correlation of superheat above the liquidus temperature and fluidity for ferrous alloys and one copper alloy. This seems to be a logical relationship in most cases when a relatively voluminous phase such as austenite precipitates at the liquidus. At this point, the occurrence of a mesh of solid particles increases the viscosity greatly. Until the region near the solidus is reached, the viscosity shows only relatively minor changes with temperature. In cases where a minor amount of precipitation occurs, as in the formation of hypereutectic graphite, the

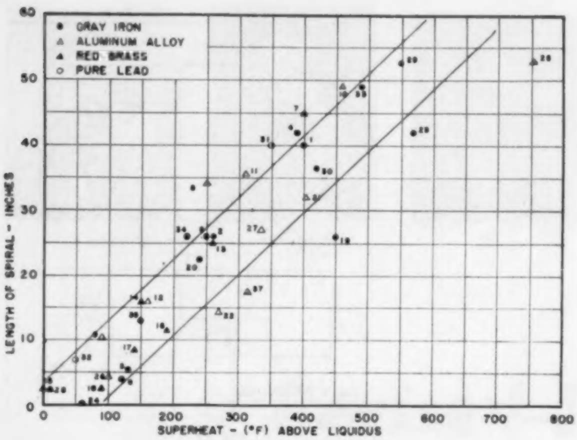

Fig. 3—Relation between fluidity and superheat for variety of alloys shown in Table 2.

metal will retain its fluidity until it nears the solidus.

To expand the data of Schaefer and Mott using the simplified spiral, a number of high frequency induction furnace heats in various alloys were made as listed in Table 2 and illustrated in Fig. 3. No exact analyses were deemed essential since the principal search was for the correlation of superheat above the liquidus (loosely termed freeze point) and fluidity. Despite the wide range of pouring temperatures (640 –2750 F), the spiral length plotted against superheat above the liquidus provides good correlation. Similar data have been obtained for steel[1, 2], ductile iron[3], and aluminum bronze in recent laboratory heats.

These data when combined with those of Schaefer and Mott lead to the principal conclusion that fluidity is, to a first approximation, a function of superheat above the liquidus. A great many confusing data are present in the literature, which seemingly contradict this simple principle. One common comment is that certain film-forming alloys do not follow this rule. In particular, so-called "oxidized" iron, aluminum and chromium-containing irons and steels are cited. In all cases investigated, the error has been in temperature measurement. If an optical pyrometer is sighted on the surface of these alloys, the higher emissivity of the oxide film provides an erroneously high reading. The observer believes the melt is superheated to a greater value above the freeze point than is actually the case and blames the composition for the poor fluidity.

The power of this general approach to fluidity is evident in several practical ways. When an intricate casting is to be made, the composition should be established to provide the minimum practical liquidus. In the case of ferrous alloys, this means special attention to carbon, phosphorus, sulphur, and nitrogen contents. When a casting is to be made in a new analysis—if a history of the proper pouring temperatures in an old analysis is available—the range for the new analysis may be readily set at the same superheat above the liquidus.

Acknowledgment. The authors wish to thank Louis Ruffins and Randolph Gordon of the staff of the Cast Metals Laboratory, University of Michigan, for their skillful assistance in this work.

TABLE 2—FLUIDITY—LIQUIDUS RELATIONSHIPS

Point No.	Cstg. No.	Pouring Temp. deg. F	Super Heat deg. F	Length of Spiral inches
Gray Iron				
Freeze Point 2300 F				
1	257-5	2700	400	40
2	257-8	2560	260	26
3	257-10	2430	130	5.5
Freeze Point 2240 F				
4	270-3	2630	390	41.75
5	270-5	2490	250	26
6	270-5	2360	120	4
Al-5% Si				
Freeze Point 1200 F				
7	260-4	1600	400	45
8	260-6	1450	250	34
9	260-8	1290	90	10.5
Freeze Point 1140 F				
10	272-3	1600	460	49
11	272-5	1450	310	35.5
12	272-7	1300	160	16
Red Brass (85-5-5-5)				
Freeze Point 1940 F				
13	258-2	2200	260	25
14	258-5	2090	150	16
15	258-7	1940	0	25
Freeze Point 1920 F				
16	271-3	2110	190	11.5
17	271-5	2060	140	8.5
18	271-7	2000	80	2.5
Gray Iron				
Freeze Point 2160 F				
19	295-1	2610	450	26
20	295-3	2400	240	22.5
Freeze Point 2180 F				
23	297-1	2750	570	42
24	297-4	2240	60	0.25
Freeze Point 2180 F				
29	303-1	2730	550	52.5
30	303-4	2600	420	36.5
Freeze Point 2180 F				
33	300-1	2670	490	49
34	300-4	2400	220	26
35	300-6	2330	150	13
Aluminum Alloy				
Freeze Point 980 F				
21	296-1	1385	405	32
22	296-5	1250	270	14.5
Freeze Point 980 F				
25	298-2	1735	755	53
26	298-6	1080	100	4.5
Freeze Point 1120 F				
36	301-1	2080	960	60
37	301-6	1435	315	17.5
Brass (70% Cu - 30% Zn)				
Freeze Point 1680 F				
27	299-2	2015	335	27
28	299-6	1690	10	2.2
Lead				
Freeze Point 590 F				
31	302-3	940	350	40
32	302-1	640	50	7

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J. L. CARTER
Cost Consultant,
Gray Iron Founders' Society

From Price per Pound to Price per Piece

Trend toward pricing castings by the piece instead of the pound continues to gain momentum. The author tells why, and gives advantages to the foundry and the customer, in this article reprinted from the Gray Iron Founders' Society's *Gray Iron News*.

■ Increasing use of the price-per-piece method is greatly to the advantage of the foundry industry as well as to the buyer. Many of the more progressive foundrymen favor selling castings by the piece instead of by the pound and the trend in this direction has been strong in recent years. Today such a large proportion of the total sales of gray iron castings is sold by the piece that it seems likely this method will become universal.

The trend is due largely to the great improvement in costing practice among gray iron foundrymen, as a result of the continuous G.I.F.S. campaign, since 1930, to promote the adoption of sound cost methods. These methods have encouraged the practice of calculating costs on individual castings on the basis of a cost per piece rather than a cost per pound. The psychology of improved cost methods has led the foundryman to consider the making of castings as a manufacturing process in which he is dealing with individual jobs, rather than with a bulk commodity.

Has Impaired Foundry Business

The sales psychology of quoting prices "per pound" is unsound and has seriously impaired the foundry business. This practice has built up in buyers' minds the idea that "gray iron castings are worth about so many cents per pound," which implies that *all* gray iron castings are in the same class costwise and are all worth about the same price per pound. Thus, they reason, any price per pound which is much above the average is an unjustifiably high price and should be questioned.

This attitude is, of course, unreasonable for the only test of whether a price is fair or not is whether it is based on actual cost plus a fair profit. In many cases the cost *per pound* of a light, complicated casting is two to three times the average cost per pound of castings, or even higher. Nevertheless, this attitude was very common in the old days, not only among buyers, but even among foundrymen, and that it still persists today to some extent.

The idea originated primarily from two conditions that were widely prevalent in the early years of the foundry industry:

Zenith Foundry Co.

Pricing by piece is continuing trend.

1. The practice of quoting flat prices—one flat price per pound for a customer's entire requirements. Under this practice, buyers obtained expensive castings for the same price per pound as cheap castings, the foundryman figuring that his losses on expensive castings were made up by his profits on simple, complicated castings. Under such conditions it was natural and inevitable that the buyer acquired a fixed idea that all castings were worth about the same price, as exemplified by the classic question "What are gray iron castings worth?" and that foundryman who tried to get a fair individual price for light, expensive castings ran up against strong sales resistance.

2. The second factor was the extremely low level of cost practice among foundrymen in the old days, a level so low that few foundrymen had any real cost system at all, and very few had any idea concerning the cost of the more expensive jobs. In most instances costs were actually calculated on an average cost-per-ton basis.

Fortunately, and due largely to the cost educational activities of G.I.F.S. since its organization in 1928, the level of cost practice in the gray iron field has risen tremendously and the practice of quoting flat prices has been abandoned by progressive foundries in most sections of the country. This has gone a long way toward teaching buyers (and foundrymen) that a high price per pound is not necessarily an unfair price. But the old attitude has become so firmly ingrained that it still exists to some extent. Any high price per pound is still suspect no matter how fair it may be on the basis of the actual cost per pound.

Another reason for preferring a piece price policy is that it tends to put castings on the same plane as other manufactured products. Practically all other types of fabricated products are sold as a manufactured article. Bulk products which are sold by the pound or ton, like sand, cement, pig iron, scrap, etc., seem to have in men's minds a somewhat lower status than products which require skillful fabrication such as machining, toolmaking, patternmaking, or special machinery. Actually there is nothing that requires a higher degree of skill, experience, and "know-how" than a complicated casting. Foundrymen who take real pride in their craft resent the idea of putting castings in a class with bulk products that are sold by weight. Gray iron is definitely not a bulk commodity!

No Additional Clerical Work

Quoting prices by the piece does not involve any additional clerical work in foundries that have already adopted a policy of quoting individual prices only, and this policy is now standard practice in most progressive foundries.

A policy of selling castings by the piece is advantageous to buyers as well as sellers. Some of the advantages from the buyers' standpoint are:

1. It simplifies the work of the buyer's Cost Department in figuring the cost of his product, since the cost of a casting in dollars would appear directly on the records. It is not necessary to look up the weight and multiply by the cost per pound.

2. The work of the Receiving Department is simplified since it is not necessary to weigh the castings—they merely have to be counted. On small lots of heavy castings, the time saved is considerable.

3. The buyer knows exactly what any casting is going to cost him. On a pound price basis, variations in weight involve variations in cost.

4. On some castings a piece price policy tends to make castings come more true to pattern. On certain types of castings, particularly large thin jobs, there is always a possibility that careless molding may result in increased thickness and increased weight. This is bothersome to users, not only because the cost is increased on a pound price basis, but also because the weight of their products is increased and a slight change in dimensions may cause trouble in assembling or machining.

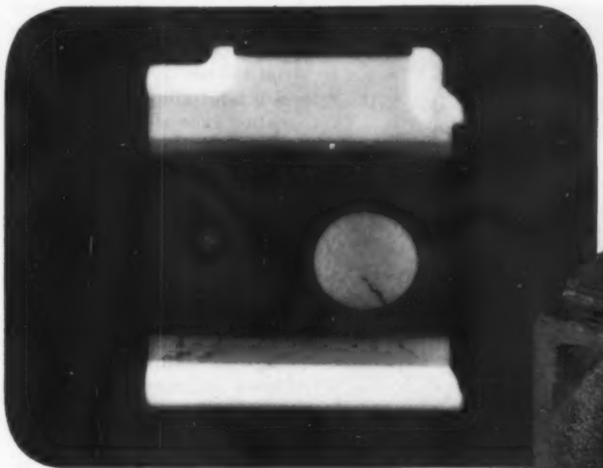
Increases Return to Foundry

On a pound price basis, such an increase in weight increases the return to the foundry. While no honorable foundry manager (and the vast majority of foundrymen are honorable!) would deliberately encourage such increases in weight, the control exercised by the foreman over such variations from pattern is likely to be a little more strict if he knew that such variations would result in extra cost to the foundry instead of a larger cash return to the foundry!

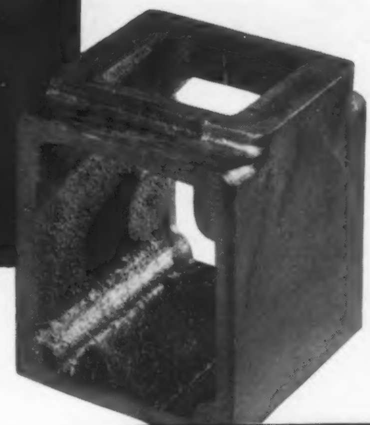
5. The purchase of castings on a price per piece instead of a price per pound basis tends to improve the accuracy of the costing of the various products which the buyer manufactures. In the old days when flat prices were common, and when the level of cost practice was often low among buyers as well as among foundrymen, many buyers preferred flat prices because they made it easy to estimate the total cost of castings in a particular machine by merely estimating their total weight and multiplying by the flat price. This is still the practice in a good many captive foundries and it can lead to serious errors because the average cost per pound of the castings in a light machine may be very substantially higher than in a heavier machine. Even when the manufacturer buys castings at individual prices per pound, his cost department may have a tendency to use an average cost per pound in pricing some machines. But, if he buys castings at a price per piece, such averaging becomes impossible and he is sure to get a more accurate cost of the castings in each type of machine that he manufactures.

The above arguments can be used by a foundryman to sell the idea of price per piece to any customer who might object to it. However, the delay in changing from price per pound to price per piece is not due nearly so much to buyers' resistance as it is to the preference of some foundrymen for doing things the way they have always done them and their failure to realize the important advantages of the piece price policy. Every reform in the practices of the industry has come about in the same slow gradual way—the most progressive foundrymen lead the way and others gradually follow their good example.

Foundrymen who are among the followers and who are still quoting prices by the pound, will be surprised to find how many of their more progressive fellow foundrymen have been quoting on a piece price basis for years.

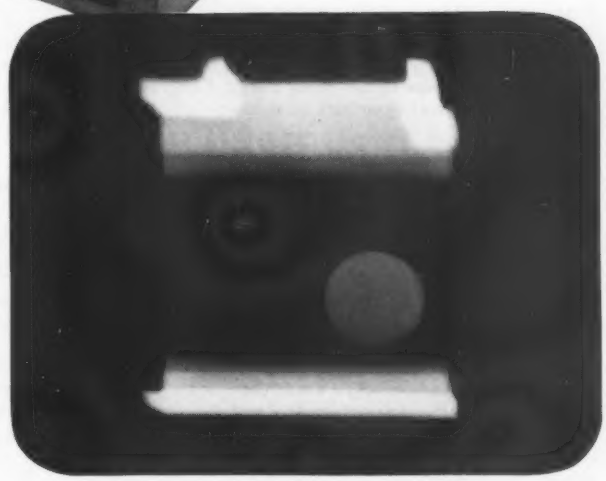


Radiograph shows recurring irregularities due to shrinkage.



RADIOGRAPHY

puts the finger on a profit thief



A change in gating produced sound castings.

Shrink was a problem in casting this instrument housing of 355 aluminum. It looked like the yield would run low.

But radiographs of pilot runs put the finger on the cause—revealed a pattern of recurring irregularities. This suggested a change in gating which, when adopted, quickly corrected the difficulty.

Cases like this show why more and more foundries make radiography a routine practice. It proves their work sound—helps build a reputation for consistently good castings.

Wouldn't you like to know how Radiography can work for you? Get in touch with your x-ray dealer. Or, write us for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

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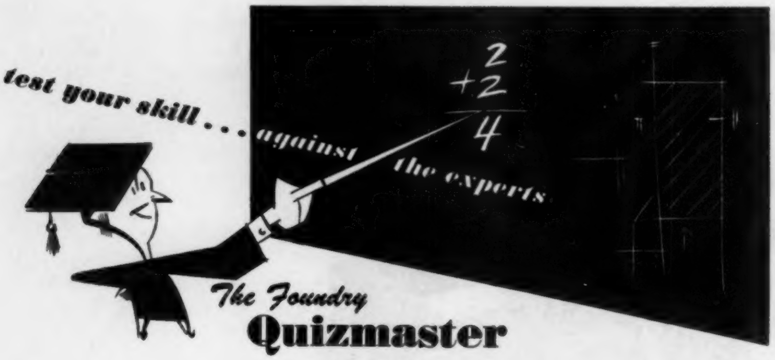


Test your foundry knowledge with "The Foundry Quizmaster." Your reward for taking the quiz: Increased knowledge of f oundry practice. Questions this month deal entirely with permanent mold washes and coatings. Answers will be found on page 91.

WALTER E. LANG / *Acheson Colloids Co.*

Permanent molds used for casting aluminum, magnesium, and their alloys are coated with mold coatings or dressings.

These coatings are of two distinct kinds, the insulating or refractory variety and the lubricating or parting type. The former, by definition, possesses good insulating properties and contains a cement that bonds it to the mold to improve adhesion and durability. The latter, black in color, contains graphite. This material is an excellent lubricating and "parting" agent. When the particles are reduced to extremely small sizes (colloidal) and suspended in water they can be applied to a hot surface and will form a tenacious lubricating film.

With these fundamentals in mind, how would you answer the following questions?

1. **What is the function of an insulating coating? ______**
   a. To protect the mold.
   b. To absorb gases.
   c. To aid metal flow.
2. **Why is it preferable to spray rather than brush these coatings onto the molds? ______**
   a. To get a smoother coating.
   b. Because a brush will be damaged by the hot mold.
   c. To save material.
3. **Why are coatings applied when the mold is hot? ______**
   a. To get proper bonding of the coating to the mold.
   b. To cool the mold.
   c. To get faster drying of the coating.
4. **What parts of a mold generally require the heaviest application of this type of coating? ______**
   a. Gates
   b. Risers
   c. Cavity
5. **If the coating tends to flake off is it due to: ______**
   a. Coating not fresh
   b. Metal too hot
   c. Mold surface not clean
6. **How often must a mold be recoated? ______**
   a. When the finish on the castings is no longer satisfactory.
   b. Daily
   c. Weekly
7. **What causes a coating to form blisters shortly after application? ______**
   a. Mold surface not clean
   b. Improper formulation of the coating
   c. Mold too hot
8. **A rough finish on the coating is due to: ______**
   a. Air pressure too high
   b. Air pressure too low
   c. Coating not diluted enough
9. **How can the surface of a coating be improved if rough due to improper applications? ______**
   a. Impossible, remove and re-coat
   b. Use of fine steel wool
   c. Buff with damp cloth.
10. **A rough finish on the casting is due to: ______**
    a. Coating not dry when metal was poured
    b. Rough finish on coating.
    c. Metal too hot
11. **Why is a lubricating (non-insulating) coating generally used? ______**
    a. To get better flow into thin sections
    b. To cool the metal faster and speed up production.
    c. To help in ejecting the casting
12. **When should a lubricating coating be sprayed on top of the insulating type? ______**
    a. When the casting cools too slowly
    b. When both insulation to keep the metal hot and lubrication or "parting" to permit easy removal are required
    c. To prolong the life of the insulating coating
13. **When can a lubricating coating be used alone? ______**
    a. When the sections of the casting are thin
    b. When the casting sections are thick
    c. For coating cores

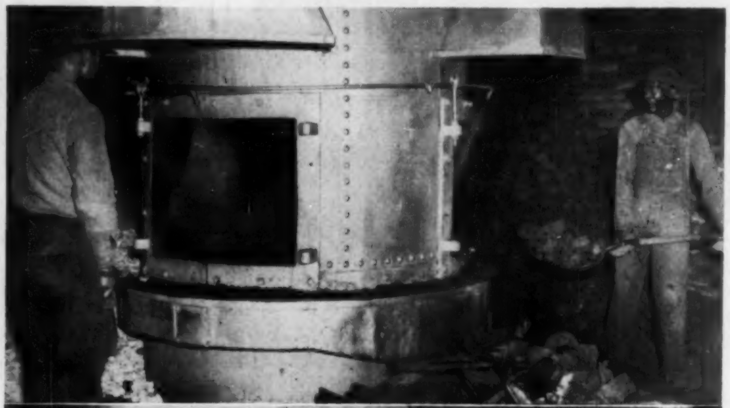
14 **When is a lubricating type coating not required? ______**
   a. When there is adequate draft
   b. When the mold will fill out without it
   c. When the metal is poured hot enough

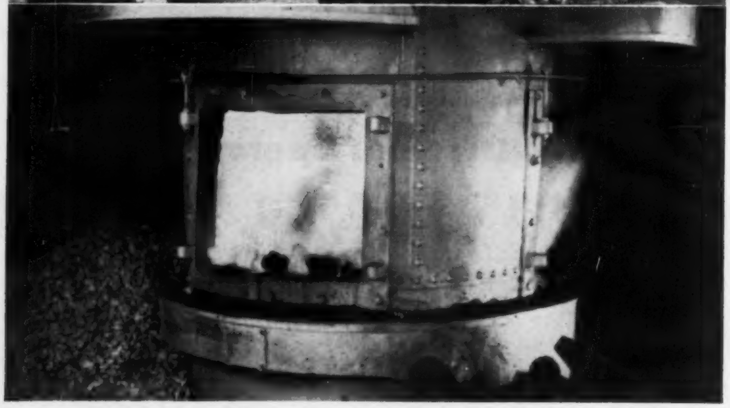
15. **Why not mix the two types of coatings together to make an all-purpose coating? ______**
    a. They cannot be mixed due to curdling
    b. The coating will be weak
    c. The finish would be poor
16. **What is the best way to remove mold coatings? ______**
    a. Wash with solvent
    b. Sand blast
    c. Wire brush

Answers are printed on page 91.

Air-operated permanent mold open for casting removal and spraying.

Now, There's an Idea!





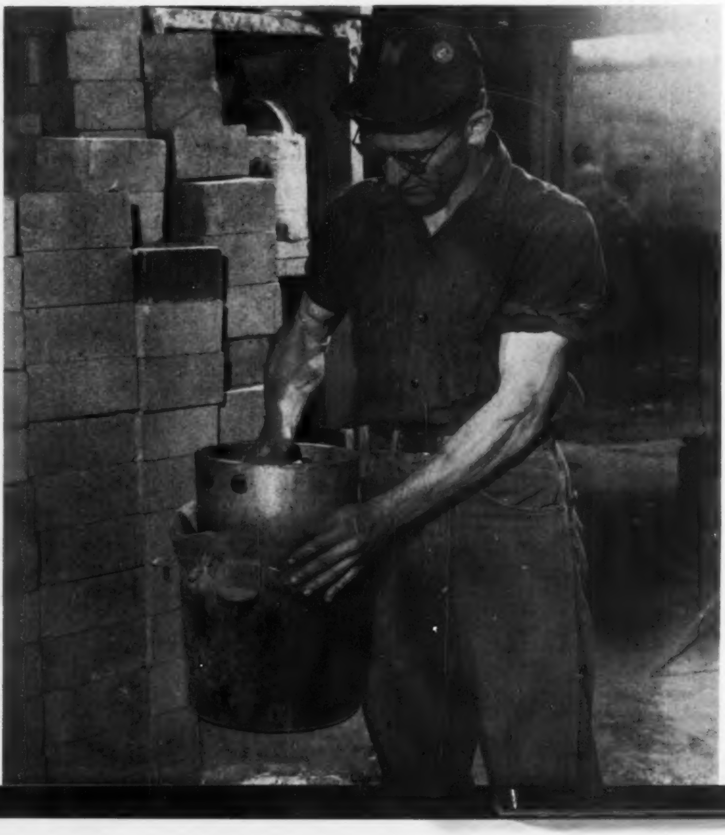
Practical ideas, developed and proved in foundries and pattern shops, are presented in this column. They may be of any length, preferably short, illustrated by photo or sketch.

■ A simple, inexpensive water-spray arrangement prevents discomfort to the cupola charging crew and keeps charging-room sprinkler heads from going off at LaPorte Foundry Co., LaPorte, Ind. Until air volume was increased from 4000 to 5000 cfm, excessively hot, long flames did not issue from the charging doors, even though the distance from base plate to charging doors is only 10½ ft, according to A. J. Rumley, Jr., general manager of the company. First step after installing the new blower was to put in hoods over the doors. The heat and flames still created a problem. Then a plenum chamber was built under the doors so that a blower could force an air curtain upward into the hoods. Cost of changes at this point was $1284 and the problem was still unsolved.

Then Ed Mathis of Pickands Mather Co., Chicago, suggested installing a spray nozzle over each door and projecting a water spray into the cupola. These cost $3.30 plus bringing up a water pipe which was done by the foundry maintenance man. The water sprays solved the problem (compare photos); the water does no damage to the lining nor the iron.

■ Linings of pouring ladles at the La Crosse (Wis.) Works of Allis-Chalmers Mfg. Co. last two to three months. Secret is in the way they're prepared. After positioning a bottom tile, a cast aluminum pattern is placed in the ladle. A nearly-dry refractory mix is densely rammed with a bar into the space between the ladle and the pattern. The mix is rammed up to within two inches of the top. Then the pattern is withdrawn so the remainder of the lining can be installed and feathered out to the ladle shell.

The completed lining has a smooth, almost glass-like surface. High density and low moisture minimize cracking during drying and preheating and the ladle is used without a refractory wash. Lining thickness is ⅝—¾ in. The pattern is easily withdrawn because of the taper. Being rounded at the bottom, it produces a nice fillet at the junction of the bottom tile and the rammed wall.



How to Calculate Thermal Conductivity

COLLIN HYDE, JOHN QUIRK, N. H. KEYSER
Battelle Memorial Institute, Columbus, Ohio

A knowledge of thermal conductivities is important for sound furnace design. Combined with other pertinent properties of refractories, such as hot strength, spall resistance, and slag resistance, it often determines the economics of any particular furnace design.

Likewise the proper selection of materials for molds and cores requires a knowledge of the thermal conductivities of the materials involved. Rates of chill, shrinkage, and metal feed are influenced in obvious ways by the thermal conductivity of the cast metal and the refractory mold.

Unfamiliar Data Units

Very often data on thermal conductivities are given in units unfamiliar to the foundryman. For the convenience of the foundryman, furnace and mold designers, and others interested in thermal conductivity, typical values for the more widely used refractory materials are shown in the accompanying chart. Thermal conductivity is shown in the four units most commonly found in the literature. The chart is designed so that the foundryman can plot thermal conductivity values for other materials directly on it. Once the data are plotted, he then has thermal conductivity in terms of any of the four units. By the use of the chart, he eliminates the necessity for converting values from one system to another.

Useful for Heat Calculations

The chart will be useful in calculating the heat loss or determining the heat-containing efficiency of various furnace designs and materials. Furnaces, ovens, and refractory structures in general serve primarily as containers for heat and process materials. The efficiency and the temperatures attainable depend largely on how well the refractory structure keeps heat from passing through the furnace wall.

Holding a furnace at temperature is like trying to keep a rubber balloon with a hole in it inflated. The size of the hole determines the loss of air from the balloon and hence the rate at which air must be pumped into it. Similarly, the thermal conductivity of a refractory furnace lining determines

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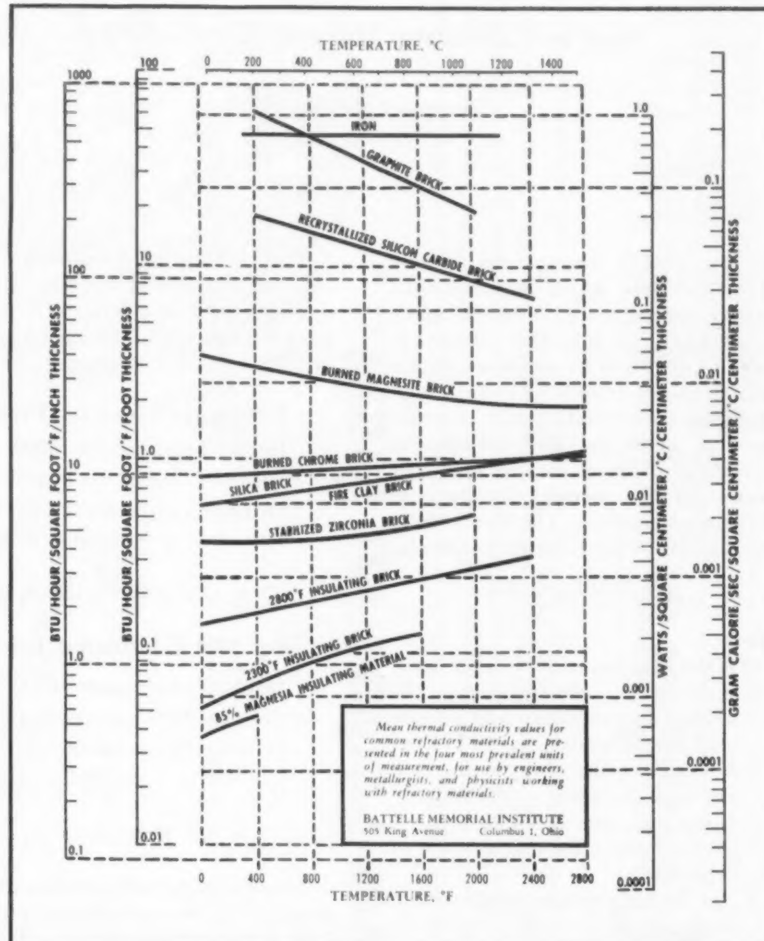


Mean Thermal Conductivity Conversion Chart

How to Calculate Thermal Conductivity

(continued from page 65)

the loss of heat through the furnace walls. This loss, which increases with furnace temperature, must be made up by heat put into the furnace in order to maintain its temperature. To calculate the rate of heat loss through a furnace (or any solid) wall, it is necessary to know the wall dimensions, the temperatures of the hot and cold faces, and the thermal conductivity of the wall material. The rate of heat loss is given by the following formula:

$$Q = \frac{KA(T_H - T_C)}{L}$$

where:

Q is the heat loss in BTU's per hour.
K is the thermal conductivity (at the average of the inside and outside wall temperatures) in BTU's per hour per square foot per degree F per inch thickness of the wall.
A is the wall area in square feet.
T_H is the hot-surface temperature in degrees F.
T_C is the cool-surface temperature in degrees F.
L is the wall thickness in inches.

The use of the chart and the above formula is illustrated below in the calculation of the heat loss through (1) a one-sq ft area of a 9-in. wall of ordinary fire-clay brick, and (2) a 9-in. wall of 2300 F insulating brick.

For Heavy Fire Clay Brick

Inside Temperature–2000 F
Wall–9-in. heavy fire-clay brick
Outside Temperature–470 F

$$Q = \frac{9 \times 1 \times (2000 - 470)}{9}$$

$$Q = 1530 \text{ BTU/hour/sq ft}$$

For 2300 F Insulating Brick

Inside Temperature–2000 F
Wall–9-in. 2300 F insulating brick
Outside Temperature–200 F

$$Q = \frac{1.2 \times 1 \times (2000 - 200)}{9}$$

$$Q = 240 \text{ BTU/hour/sq ft}$$

This example indicates that replacement of the heavy firebrick wall by a 2300 F insulating-firebrick wall would reduce the heat loss through the wall by a factor of more than six.

City Pattern Foundry & Machine Co.

Thermal conductivity is an important factor in melting efficiency.

Industry hosts high school group in plant visit

ASHLEY B. SINNETT
Educational Director, AFS

Announce AFS Foundry Educational Program

In the fast moving technological society of today, more thoroughly trained personnel are needed. The foundry industry is no exception.

The war period placed demands upon the industry that were met with mechanization and automation, thus reducing the need for many of the old school craftsmen and increasing the need for skilled employees who can operate foundries using new production methods.

With such facts evident, and with recognition of the continued trend of the industry from an art toward a science, the American Foundrymen's Society is embarking on a five-fold national educational program. To be administered through the AFS chapters, the program is aimed at bringing promising young men—who can no longer be expected to come knocking on foundry doors seeking employment—into the industry. It is necessary that a strong publicity and recruitment program be established along with the offer of a sound career for young men in the industry.

Areas in which the new program will operate are designated: High School Cooperation, In-Plant Training, Community Promotion, Student Chapters, and Teacher Training.

High School Cooperation. Probably the largest activity in the program, the one in which the greatest number of students can be reached, is through High School Cooperation. Of all technical-vocational high schools, only 12 have foundry programs and laboratory facilities, and these are not as active as they might be. The goal of the AFS activity is to rehabilitate such programs and institute new studies at this level.

In addition to the technical-vocational programs, AFS will endeavor to develop within the industrial arts curricula of the general secondary high schools survey studies in cast metal processes. It is felt that by introducing such courses at this level it will be possible to reach greater numbers of students. Developed as a survey or occupational information type of study, this course work will emphasize careers and opportunities available within the foundry industry.

An instance of industry's feeling toward a high school program is exemplified in the recent grant of $50,000 by the Pangborn Corporation to be used by worthy candidates for scholarships to help them build a career in the foundry industry.

With a sound, basic understanding by high school graduates of the requirements of the foundry industry, it is expected that a percentage of future college students will seek their careers in this basic industry. A glance at the total educational program of AFS shows that an outstanding cooperative venture could materialize, with these high school graduates supplying the necessary student material for the Foundry Educational Foundation's college program.

With cooperation of industry with the AFS chapters and the high schools, the national program will have as corollaries the development of new and up-to-date guidance material that can be used by the chapters in their work at the high school level. Notice of availability of such material will be posted in high schools throughout the country.

Additional material in the form of visual aids, slide sequences, and teaching aids for use by the instructors of foundry and science will also be developed.

In the case of a new program beginning in a high school, grammar school, or technical-vocational school, AFS Headquarters has as one of its services the offering of suggestions and recommendations in the development of curricula and selection of physical equipment to be used in the laboratories.

The experience that the student obtains in high school will often govern his later decision in choice of vocation. Therefore, it is important that the correct equipment and curriculum be provided in order that his experience with

foundry study be interesting and inspiring.

As a guarantee to the success of a high school program, it is necessary to follow through in such a development. Industry is in an excellent position to assist several ways in a continuing program of cast metals study. One way is to assure the obligation of hiring graduates from these courses. This is extremely important. It is absolutely necessary that graduates find their niche in the foundry industry in order that the program attain maximum success.

The industry is also in position to offer the schools special lecturers, and to give the necessary technical assistance in continuing operation of the course. It is recommended that these men be from top management or possibly some one of the student's fathers who is active in the industry. All phases of the operation from sales to shipping should be included so the students get a complete picture of foundry operations.

AFS chapters can encourage financial assistance from local industry for the procurement and operation of suitable equipment with which to teach. Students and teachers can be invited to the monthly meetings of the chapters. Contests between the students with awards for the winners can be developed. It might be possible to endow scholarships to start the students in their college education.

In-Plant Training. Second of the five activities of the total program is In-Plant Training. Results of this particular phase of the program probably will be realized much earlier than other of the activities. Immediate action in this activity has been taken by the newly-formed Joint Committee on Foundry Vocational Training. Duty of this group is to write manuals of instruction designed for the small and medium-size foundry to be used in the training of line supervisory personnel.

This particular activity stems from a meeting of the National Castings Council and has received the Council's enthusiastic backing. The committee will be composed of members of the several foundry trade associations and will operate under the AFS Educational Division.

The manuals to be developed will enable a qualified supervisor to take a chosen group of candidates from his shop and instruct them in the theories of foundry operation relative to his own foundry. Regardless of the type of shop —steel, gray iron, malleable, or nonferrous—the correct information for the necessary instruction of the desired operation will be in the manuals. It is tentatively intended that this program within a foundry will take approximately two years to complete.

Community Promotion. The third feature of the total program is closely associated with the high school and in-plant training activity. It is Community Promotion. While contacting the high schools, it will be found that there are groups of people who are either completely ignorant of the cast metals industry or think of it only as a dirty, dusty, hot place to work. Parents of students and young men often have definite personal convictions as to the vocation their children should pursue. It is up to industry as a consolidated group of foundrymen to promote the industry within the community and to show the people that the foundry industry, very definitely, offers desirable careers for their children.

It is suggested that the chapters conduct this activity through the various civic organizations such as the Lions, Rotary, Kiwanis, PTA, etc. In many cases, foundry management will be members of these organizations and will be able to assist in the development of a worthwhile program. Once the good will of a community has been gained, and the people realize that industry is sincere in its efforts, the roads into the high schools will be much easier. In turn, increased benefits will be realized from the program.

Student Chapters. As a fourth activity, AFS intends to further develop and assist in the activities of student chapters of the various colleges and universities. The young men of these student chapters will presently be the junior members and future top management of the industry. They welcome a feeling of acceptance in the field they are pursuing. Foundrymen should invite them into the shops . . . open the doors . . . work with them collectively or individually to see that they are given the correct orientation to industry.

Methods of attaining such a goal are many; suggested in particular are dinner meetings, technical sessions, possibly invitations to assist in research work, and in general, over-all acceptance by present management. Such invitations will make the individual realize that the industry is in need of college trained personnel and that they are welcome in the foundry industry. Such an activity is a good investment in the future of the individual foundry and the industry.

Teacher Training. The fifth activity of the program involves assistance in development of courses in cast metals to be instituted in our teacher training institutions. An adjunct to the high school and in-plant training program, it must be carried on in our teacher training colleges and universities because even when the high school program has been accepted by the educators of the community qualified teaching personnel at the secondary level are still needed. In the past, instruction relative to cast metals in both levels of education has been greatly de-emphasized.

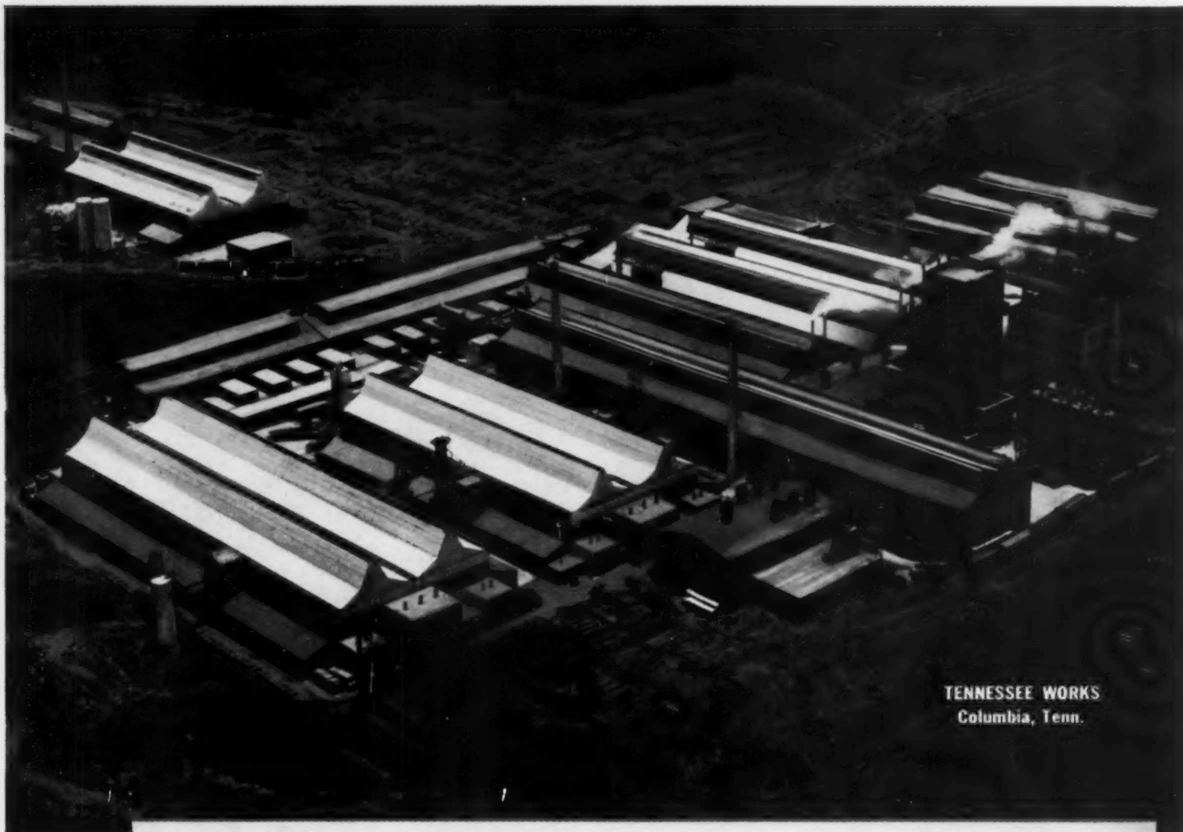
Today but one college or university has made it known that it has a course in cast metals designed specifically for the prospective or graduate industrial arts teacher.

While many teacher training institutions might find it difficult to alter their curriculum to include a cast metals course for their industrial arts teachers, the problem is being solved by one of the Big Ten colleges. This school has tentatively accepted a concentrated summer work shop course in cast metals to be open only to industrial arts teachers.

It is possible to sell the foundry industry to communities and high schools. At the same time it is absolutely necessary that there be the qualified teachers within them to instruct in cast metals. Probably the greatest single cause of the conditions of the technical-vocational high school foundry and patternmaking programs is the inability of school administrators to hire qualified teachers. It is the intent of AFS and its chapters to correct this by stimulating and establishing such course work in the teacher training colleges and universities.

Many suggestions can be given but the final analysis and synthesis must be made within the local situation. The field of education in cast metals is a fertile one and the avenues of operation are many. The answer to the question "Where can I go to get operating personnel," might well be found in the statement: By properly educating the peoples of our communities in the practice and requirements of the foundry industry. By and large, the total program in relation to AFS chapter activities might basically be regarded as a promotional program. It is necessary that the foundry industry be sold to the people and the foundrymen are the only ones who can properly do it.

Dr. F. B. Rote, Albion Malleable Iron Co., Albion, Mich., is introduced as guest speaker at annual student-industry banquet of Michigan State College Student Chapter.



FIVE REASONS WHY NATIONAL CARBON COMPANY ELECTRIC FURNACE ELECTRODES GIVE YOU THE MOST FOR YOUR MONEY...

ELECTRODE QUALITY . . . has a direct bearing on the quality of *your* product; in many instances, it can materially affect your *cost.* National Carbon's graphite and carbon electrodes are, and always have been, the finest quality obtainable *anywhere.* We make this statement without reservation.

NEW PRODUCT DEVELOPMENT . . . is basic in technological progress. National Carbon has *always* done the major part of this country's electrode research and development . . . a share out of all proportion even to its outstanding leadership in the production and sale of these products. This is a matter of long-standing record.

PLANT CAPACITY . . . National Carbon's ability to *produce* is at an all-time high. The five plants shown here are fully integrated for production of both carbon *and* graphite electrode products — a situation rare in the industry and in keeping with National Carbon's far-sighted planning to pace requirements of a rapidly-expanding economy. For example, plant additions in the last five years alone have more than doubled graphite electrode capacity.

EXPERIENCE . . . of National Carbon is the foundation, building blocks and cornerstone of electrode-products manufacture in this country. First with commercial production of both carbon and graphite electrodes in the early 1900's, National Carbon introduced the first of each increasingly larger electrode size from that time to the present, plus a host of successful accessory items for improved application of electrodes in the metallurgical field. Today, National Carbon is the only company producing carbon electrodes up to 45″ diameter; graphite electrodes to 35″. Even larger electrodes and other massive shapes can be made with present facilities. Inquiries are invited.

RESPONSIBILITY . . . to customers and to the industry as a whole . . . expresses itself several ways in National Carbon history. The company has consistently kept ahead of demands for both quality and size of electrode products; National Carbon research stands virtually alone in the steady march of new product development; and, in the field of *service,* National Carbon is supreme. For many years we have conducted an expanding, electrode technical-service operation, staffed by a group of electrode experts, specially trained to help you get ***more for your electrode dollar.***

The terms "National" and "Acheson" are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

District Sales Offices:
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IN CANADA:
Union Carbide Canada Limited, Toronto

Book Reviews

Das Giessereiwesen in Gemeinfasslicher Darstellung (A Comprehensive Treatise on Metal Founding) . . by H. Schmidt. 349 pp., 237 fig., 45 tables. Published by Giesserei Verlag, Düsseldorf, Germany. 24 German Marks (Third edition, 1953).

This book is a joint effort of three foundrymen's associations and of 18 collaborators. It deals with every phase of foundry work from early history to finished modern castings. It contains the following details of foundry practice: making patterns, materials for molds and cores, molders' tools, making molds and cores, drying molds and cores, fuels used in the foundry, raw materials, melting furnaces, calculation of composition of charge, preparation of molds and pouring methods, cleaning of castings, heat treatment and improvement of surfaces, properties of castings and methods of testing, defects in castings, arrangement and floor space of foundries, requirements of heat and power, cost keeping, etc.

The book is a condensed encyclopedia of metal founding. It is one of more than 80 books that have been published on foundry practice in Germany since 1949. Foundrymen of experience may wish that some phase of foundry practice had been treated more exhaustively. However, the book was not written for experts, but for those who wish to become experts. This latter purpose it serves admirably.—W. Trinks, Professor Emeritus, Carnegie Institute of Technology.

Fehlererscheinungen an Guss-Stücken (Defects in Castings) . . By E. Knipp. 261 pp., 258 fig., 26 tables. Published by Giesserei Verlag, Düsseldorf, Germany. 26 German Marks (1953).

Extremely interesting, the book deals with pipes, cavities, blowholes, non-metallic inclusions, sand-filled depressions, burnt-in sand, incomplete filling of mold, segregations, cracks, and warping.

The causes of these defects and the means for their prevention are discussed in great detail for cast iron (gray and chilled), malleable castings, steel castings, heavy non-ferrous metals, and for light metals. What makes the book so interesting is the fact that widely different treatments are needed for the prevention of defects in different metals. A treatment that prevents blowholes in one metal causes blowholes in another metal.

Knipp's book is, so far as the author knows, the only comprehensive treatise on this subject (in book form). It is based not only on the experience of the author, but also on the experience of many other foundry experts. Knipp cites 280 references, almost all of which were woven into the text. Many of these references were taken from British and from American publications. —W. Trinks, Professor Emeritus, Carnegie Institute of Technology.

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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

Why 3 Per Cent Chrome Steel Makes Good Castings for Wear Resistance

Castings of 3 per cent chromium steel have been used in substantial tonnages, for many years, for various equipment parts demanding good wear resistance. Such castings offer an excellent combination of hardness and toughness. Typical applications are crusher parts used in rock- and ore-crushing equipment, swing hammers for pulverizing coal, railroad switch frogs, gears, pulleys, sheaves, and other castings that must meet severe conditions of wear.

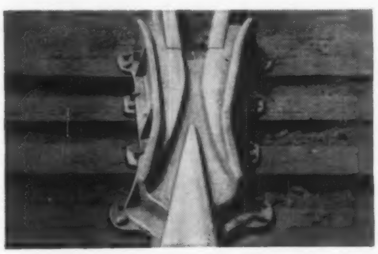

Fig. 1. Railroad switch frogs, which are subject to severe wear, give outstanding service when cast of 3 per cent chromium steel.

The 3 per cent chromium steels, are normally produced in a carbon range of 0.30 to 0.50 per cent. They exhibit excellent depth-hardening properties, which simplify heat-treatment and insure uniformity throughout heavy sections. The analysis is usually modified by a molybdenum addition, since this element aids in increasing hardenability.

Fig. 2. Grating for top of shake-out machine is cast of 3 per cent chromium steel to give good wear resistance and long life.

Properties Improved by Heat-Treatment

The best properties of 3 per cent chromium steels are developed through heat-treatment. Generally, this consists of a normalizing treatment from 1650 deg. F., followed by tempering in a range between 1000 and 1250 deg. F., depending on the physical properties desired. Double normalizing is sometimes used to obtain further improvement in the grain structure. With carbon on the high side of the specification, air-quenched castings show a Brinell hardness number of over 400 in 3-inch sections. This hardness is practically uniform throughout the section. Oil quenching is employed to produce higher hardness and depth of penetration, and even in a 4-inch section, a hardness number of over 500 Brinell is obtained.

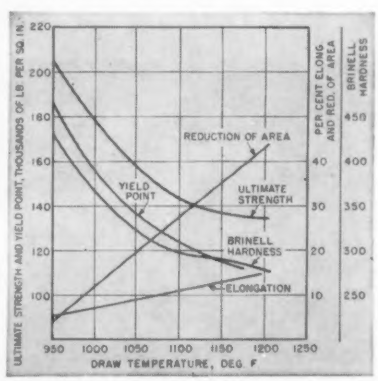

Fig. 3. These curves show the response to tempering of a 0.37 per cent carbon, 2.93 per cent chromium, 0.35 per cent molybdenum steel previously normalized from 1650 deg. F.

The steel also shows good response to tempering. After a normalize and a 1100 deg. F. treatment, it has a tensile strength close to 150,000 pounds per square inch, with an elongation value of about 12 per cent, and a Brinell hardness of about 300. When greater ductility is required, tempering should be done at higher temperatures. However, in such instances, some strength and hardness are sacrificed.

Fig. 4. Photomicrograph of 3 per cent chromium steel normalized from 1650 deg. F. and tempered at 100 deg. F. (X250). The pseudo-martensitic structure is well suited to resist abrasion.

Effect of Other Alloy Additions

Molybdenum in the range from 0.30 to 0.50 per cent will improve depth-hardening characteristics and aid in reducing susceptibility to temper brittleness in the lower temperature ranges. If the molybdenum-bearing steel contains relatively high carbon (0.40 to 0.60 per cent) additions of approximately 0.08 to 0.10 per cent vanadium provide greater uniformity in hardening. Small additions of silicon increase strength and hardness and this element is sometimes increased to 0.80 or 1.00 per cent. Manganese is added in amounts between 0.50 and 0.80 per cent.

Metallurgical Service Available

When you have occasion to produce castings for applications involving severe abrasion and wear, it will pay you to investigate the advantages of using 3 per cent chromium steel. If you need help on some specific metallurgical problem, be sure to consult one of ELECTROMET's specially trained metallurgists and engineers. For further information, write to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

Foundry Tradenews

Whiting Corp. stockholders, at their annual meeting in Harvey, Ill., re-elected the following directors: S. H. Hammond, T. L. Hammond, J. A. Handley, J. C. Thomas, J. B. Dunbar, F. M. Gillies, B. N. Everett. Following its election, the board met and re-elected these officers: S. H. Hammond, chairman of the board; J. A. Handley, president; M. J. Rice, vice-president, engineering; G. E. Seavoy, vice-president, sales; T. L. Hammond, vice-president; J. C. Thomas, secretary and treasurer; F. O. Krumm, controller and assistant secretary; R. S. Hammond, vice-president in charge Chicago office; and Dan Polderman, Jr., vice-president and director of export sales.

American Car & Foundry Co. has changed it corporate name to **A C F Industries, Inc.,** to more nearly reflect the diversification of its products and services.

Keokuk Electro-Metals Co. has a new address in St. Louis: 8230 Forsyth Blvd., zone 24.

Crane Co., Chicago, looking to its 100th anniversary, July 4, 1955, has grown from a one-room frame building constructed by the founder, Richard Teller Crane, to a $315 million business, with plants in the U.S., Canada, and England. World's largest producer of valves and fittings, Crane also manufactures plumbing fixtures and accessories for homes, institutions, and industrial construction, produces enameled steelware, heating products, and aircraft controls and accessories. A $25 million titanium ore processing plant will be dedicated at Chattanooga, Tenn., in 1955. Among Crane firsts are: first foundry west of Pittsburgh, Pa., to hire a metallurgist (1890); first foundry to develop and use a **"merry-go-round"** for molding and pouring.

Moline Malleable Iron Co., St. Charles, Ill., has purchased the foundry formerly owned by **Free Sewing Machine Co.** in order to expand facilities. Officers are: Gorton Fauntleroy, president; vice-president, P. C. De Bruyne; Dort Fauntleroy, secretary; and P. V. Maltby, treasurer.

Olin Mathieson Chemical Corp. is the name of the new corporation recently formed when stockholders of **Olin Industries, Inc.,** and **Mathieson Chemical Corp.** voted separately to merge the two companies. Assets of the new organization will total about $500 million.

Howard Foundry Co., Chicago, has formed a new subsidiary, **Howard Electric Co.,** which will manufacture a new type of electrical under-floor system for office and industrial buildings.

General Electric Co. has formed a Chemical and Metallurgical Division, which will include both the former Chemical Division and the Carboloy Department. R. L. Gibson has been appointed general manager of the new combined division, with headquarters at Pittsfield, Mass.

McWane Cast Iron Pipe Co., Birmingham, Ala., has announced the election of officers. They are: O. H. King, president; A. T. McWane, chairman, finance committee; Wm. McWane, chairman of the board; W. P. Cox, vice-president, sales; A. W. Claussen, vice-president, operations; and P. M. Lovell, secretary and treasurer.

Scheel Olivine, Inc., Mt. Vernon, Wash., is moving rapidly toward production of olivine sand and flour from its holdings in the Twin Sisters area of the Cascade mountains. Road work and bridge construction were completed in July and heavy crushing equipment is currently being installed.

Bohn Aluminum & Brass Corp., Detroit, has published a 28-page, two-color booklet highlighting its metallurgical research and development, production quality control, manufacturing methods, and assembly operations in each of the nine Bohn divisions.

Family Circle, house organ of Crouse-Hinds Co., Syracuse, N. Y., has been chosen for the fourth successive year for an award by the Freedoms Foundation of Valley Forge. The presentation was made for the publication's efforts to promote a better understanding of the American way.

Highway Machinery & Supply Co., Inc., Richmond, Va., has been appointed to sell and service the line of fork-lift trucks, straddle carriers, and other materials handling equipment manufactured by the **Industrial Truck Division of Clark Equipment Co.** The dealer will handle Clark products in the entire state of Virginia.

Lithium Corp. of America, Inc., has completed an agreement with **Quebec Lithium Corp.,** subsidiary of **Sullivan Consolidated Mines, Ltd.,** whereby Lithium Corp. will process the entire output of Quebec's new concentrating plant. The American company will be able to approximately double its output under this agreement.

Aluminum Limited Sales, Inc., New York, will open a Detroit branch office in order to help meet a growing demand by Michigan's independent fabricators for Canadian aluminum. The company is the U.S. distributor for **Aluminum Co. of Canada** of Montreal.

North American Philips Co., Inc., Research and Control Instruments Division, has opened a Chicago office at 4959 W. Diversey Ave. J. C. Washburn is manager.

Wedron Silica Co. has moved to 135 S. La Salle St., Chicago 3. Telephone remains RAndolph 6-2780.

Tractors for Michigan Production

These tractor shovels, ranging in size from 15 cu ft to 2¼ yd, will be produced in the new plant now under construction at Benton Harbor, Mich., for the Automotive Division and Construction Machinery Division of Clark Equipment Co.

News of Technical Committees

Board Research Committee. Chairman E. C. Hoenicke, Eaton Mfg. Co., Foundry Div., Detroit presided over this meeting on June 25 at the Union League Club, Chicago. AFS Technical Director H. J. Heine reviewed progress to date of the various Society-sponsored research projects. The matter of interesting private industry in carrying out more foundry research projects was discussed. The chairman read a letter from H. W. Dietert, board chairman, Harry W. Dietert Co., Detroit, containing suggestions for an expanded program of sand research. It was referred to the Sand Division Executive Committee for consideration and report. The technical director was instructed to keep all committee members advised on the status of all projects, number of meetings held by various research committees, and important conclusions reached in their investigational work.

Sand Handbook Revision Committee. The meeting was held at the American Colloid Co. offices, Chicago, on July 9. Chairman C. A. Sanders of American Colloid asked Technical Director Heine for remarks concerning the proposed new publication. Heine said that the AFS Publications Committee had recently endorsed the project, specifying that there is a definite need for a book on *"Molding Sand Practice,"* since the current *"Foundry Sand Handbook"* is really a sand testing handbook rather than one dealing with molding practice.

The committee was almost unanimous in agreeing that work on the handbook should begin immediately. Scope of the book and outline of contents would be prepared first, then carefully reviewed by committee members.

Sand Division Grading, Fineness & Distribution Committee. Meeting at the Chicago Hotel Sherman on July 8, the committee elected a new chairman, T. A. Tarquinio, American Manganese Steel Div., Chicago Heights, Ill., previously vice-chairman, who succeeded C. A. Sanders, American Colloid Co., Chicago, who resigned. W. D. Chadwick, Manley Sand Co., Rockton, Ill., was unanimously elected vice-chairman of the committee.

Because of vacancies on the committee, two nominees were named to be invited to membership: N. J. Stickney, Sand Products Corp., Cleveland; and Tom Seaton, American Silica Sand Co., Ottawa, Ill.

A letter was read describing the glass sphere technique for calibrating sieves, as developed at the Bureau of Standards, Washington, D. C. The report was prepared by R. E. Morey, Naval Research Laboratories, and J. H. Schaum, National Bureau of Standards, both of Washington, D. C. It was moved that they expand the report for distribution to all committee members.

A lengthy discussion of the various methods of describing sand grain distribution followed the reading of a paper by B. H. Booth, Carpenter Bros., Milwaukee, and C. A. Sanders, American Colloid Co., Chicago. It was agreed that use of the terms "one screen, two screen, etc." should be discouraged and that it was the responsibility of the sand producers to educate the consumers to the use of a more accurate description of sand grain distribution by use of sieve analyses.

F. P. Goettman, Standard Sand Co., Grand Haven, Mich., accepted the chairman's invitation to prepare an article for the committee clarifying the use of the word "screen" in accepted sieve analysis techniques. Use of AFS Fineness Number as a description of a molding sand was discussed and referred to future meetings.

A program was approved for the study of *"Reproducibility of Sieve Analyses,"* and it was decided to ask each of the companies represented at the meeting to buy a sample of calibrated glass spheres from the Bone Char Research Project at the National Bureau of Standards, Washington, D. C. Each company would then run sieve analyses with its standard samples and forward data to Messrs. Morey and Schaum for analysis and interpretation. A report would also be prepared showing results of sieve analyses before and after calibration of the sieves.

Air Pollution Control Committee. W. N. Davis, AFS Director of the Safety, Hygiene & Air Pollution Control Program, presided over a meeting held at the Drake Hotel, Chicago, on June 3. First order of business was a report on papers given at the Convention. Material contained in the pamphlet, "Control of Emissions from Metal Melting Equipment," was reviewed and the pamphlet was approved with suggested corrections, after which it will go to the Steering Committee for publication approval.

Sections of the pamphlet referring to non-ferrous materials were recommended for expansion to cover aluminum, brass and bronze, as well as magnesium, and certain beryllium and copper alloys, although non-ferrous metal melting has not caused a problem to the industry at the present time.

The pamphlet was subsequently approved at a meeting of the Steering Committee on June 7-8, with recommendations for further minor changes. It was estimated that the pamphlet should be ready for the printer about July 1.

Gray Iron Division Chill Test Committee. H. H. Wilder, Vanadium Corp. of America, Detroit, functioned as chairman at a Cleveland meeting on May 11. Inactivity during the preceding year left little progress to be reported. A.S.T.M. Tentative Methods of Cast Iron was reviewed and discussed. Some discussion resulted on the definition of the end of chill but it was agreed that this point was out of the scope of the committee's work.

Committee personnel was altered to obtain a wider coverage of the foundry industry. Resignations of Messrs. Bolt, Hursen, and Brooks were accepted. Chairman Wilder asked to be relieved but said he would continue his work on the committee. H. E. Henderson, Lynchburg (Va.) Foundry Co. was elected chairman, with other officers remaining incumbent. The following were proposed as new members: George Krunlauf, Republic Steel Corp., Cleveland; Walter Bohm, Buick Motor Co., Flint, Mich.; Mervin Horton, John Deere & Co., Moline, Ill.; Fred Hanson, Electro Metallurgical Co., New York; K. L. Clark, International Nickel Co., Los Angeles.

Future plans included: determination of extent of present use of wedge and chill tests as control measures; development of a means of recommending the proper test piece for various chemical compositions; and circulation of wedge and chill test pieces to members of the committee for measurement of chill and comparison of various readings.

Light Metals Division Shell Molding Committee. This committee met at Cleveland on May 11 with A. J. Marotta, Utica (N. Y.) Radiator Corp., presiding. Three members submitted data on the retained transverse strength test and other members were asked to complete their tests and submit data at an early date. It was decided that these data on breakdown properties of sand-resin mixes be submitted to AFS with a request that work be continued at some school as a research project.

Several papers for presentation at the 1955 Convention were discussed and it was emphasized that cost data and application information would be of most interest to foundrymen, and would do the most toward promoting shell molding in light metals foundries.

L. W. Woodhouse, representative of the Connecticut State Health Department, Hartford, reported that his department was investigating shell molding from the standpoint of health hazards, and suggested the possibility of a paper on that subject for 1955.

Technical Director Heine suggested the possibility of a shell molding symposium for the 1955 Convention, if other technical divisions can supply sufficient papers. If held, the papers would be published in a separate volume, similar to the recent AFS publication on gating and risering.

Light Metals Division Centrifugal Casting Committee. In a meeting held at Cleveland on May 11, W. E. Sicha, Aluminum Co. of America, Cleveland, presided. J. W. Meier, Canadian Dept. of Mines & Technical Surveys, Ottawa, Ont., re-

continued on page 91

"One unit pays for the next"

KEEN FOUNDRY COMPANY reorders

Handy Sandys 3 TIMES

Mr. Lou Keen, President of Keen Foundry Co., Griffith, Indiana, states: "We've invested in five Newaygo Handy Sandys in less than a year for several reasons. First, these individual Sand Handling Units are very adaptable to the physical characteristics of our foundry. Second, their great flexability gives us overhead sand stations at any point in the foundry without costly remodeling. Third, Handy Sandys require low capital investment."

"Naturally, the proof of the equipment's value to us is its performance. Since installation we have, in one section of our foundry, conservatively increased mold output by over 25%. In another section, in conjunction with a change in molding procedures, we are still maintaining the same mold production over a six hour period, but we are getting twice as many castings per mold."

"We also figure the molder's fatigue factor has been decreased by 50%. Before Handy Sandys the average molder shoveled about 15 tons of sand per day; now he uses the shovel for occasional cleaning up around the molding machine."

Keen Foundry Co., a grey iron production operation, manufactures castings for electric hoists, gas pumps, engines, pressure valves, air compressors, machine tools and other industries. Castings weigh from 5 lbs. up to 100 lbs. each, and the flasks used with the Handy Sandys vary from 18" x 18" to 24" x 30".

Three of these Newaygo units operate in conjunction with Osborne Rotolifts averaging about 120 molds per unit in a 6 hour period. On this job each mold has 8 castings and 4 cores. Molds are set out by molder using overhead crane hoist.

The lower sand bins and boot of elevators are sunk 3 feet into the floor almost tripling the sand capacity of each Handy Sandy Unit.

Showing two Handy Sandys over squeezer work. These units produce over 140 molds each in a six hour period. Molds are set out by operators who also handle pour off.

Sand bins on all five units are supplied from a central sand system by a Payloader.

A copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire, or phone today.

NEWAYGO engineering company
NEWAYGO, MICHIGAN

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

New officers of the Northern California Chapter, left, Chairman John Bermingham, E. F. Houghton & Co.; right, Vice-Chairman Clayton D. Russell, Phoenix Iron Works.

Chapter News

Pittsburgh Foundrymen Talk AFS Chapter

FOUNDRY leaders in the Pittsburgh area met there July 29 with officials of AFS to discuss the need for and formation of an AFS chapter. Chairman of the meeting was F. C. T. Daniels, Mackintosh-Hemphill Co., Pittsburgh, and AFS officials present included Vice-President B. L. Simpson, Chicago; National Director Thos. Kaveny, Jr., Pittsburgh; Past President W. B. Wallis, Pittsburgh; AFS General Manager W. W. Maloney and Admin. Asst. D. J. Hayes.

Attending the meeting were the following: R. C. Heaslett, Continental Foundry & Machine Co., Coraopolis, Pa.; A. Macha, Westinghouse Air Brake Co., Wilmerding, Pa.; R. H. English, National Alloy Steel Div., Blaw-Knox Co., Blawknox, Pa.; F. H. Allison, Jr., Blaw-Knox Co., Pittsburgh; A. B. Norton, Aluminum Co. of America, Pittsburgh; A. M. Cadman, Jr., A. W. Cadman Mfg. Co., Pittsburgh; Harry Dowie, Mesta Machine Co., Pittsburgh; E. A. Blasdell, Reliance Steel Casting Co., Pittsburgh; E. J. Biller, Vulcan Mold & Iron Co., Latrobe, Pa.; Robert Logie, National Roll & Foundry Co., Avonmore, Pa.

Others Attending

Others: J. W. Early, J. S. McCormick Co., Pittsburgh; R. H. Stone, Vesuvius Crucible Co., Swissvale, Pa.; E. P. Buchanan, Pittsburgh Coke & Chemical Co., Pittsburgh; W. J. White, Shallway Corp., Connellsville, Pa.; H. H. Updegraff, National Engineering Co., Pittsburgh. A telegram was read from T. F. Dorsey, Pittsburgh Steel Foundry Corp., Pittsburgh, who was unable to attend, favoring formation of a chapter.

The meeting was called primarily to discuss the new AFS dues structure effective July 1. Vice-President Simpson stated that AFS henceforth intends to finance from current operating funds such essential programs as Safety, Hygiene and Air Pollution Control, Education, a reference Library, and expanded Research. Dues of company and sustaining members have been increased to provide the necessary annual finances without contributions.

Unable to Give Fullest Service

It was pointed out that the Society is unable to provide its fullest service to foundries where no AFS chapter exists. A number of questions were asked concerning obligations of chapter status and relationships with the Pittsburgh Foundrymen's Association.

Since it was the consensus that chapter possibilities should be fully explored, Chairman Daniels appointed a Steering Committee for further discussion with officials of the Pittsburgh Foundrymen's Association. The Steering Committee includes Mr. Daniels as chairman, with Messrs. Heaslett, Allison, Kaveny and Dorsey.

New Chapter Officers

Central New York

Chairman, Joseph A. Gibson, Sweets Foundry, Inc.; *vice-chairman,* James O. Ochsner, Crouse-Hinds Co.

Chesapeake

Chairman, Michael J. Kelly, Kelco Corp.; *vice-chairman,* Joseph O. Danko, Sr., Danko Pattern & Mfg. Co.

Mexico City

Chairman, N. S. Covacovich, La Consolidada, S. A.; *vice-chairman,* Urbano Lopez Ayala; *secretary-treasurer,* Luis Delgado-Vega, Cia Proveedora de Industrias, S. A.

Mid-South

Chairman, M. B. Parker, Jr., M. B. Parker Co.; *vice-chairman,* A. P. Alexander, International Harvester Co.; *secretary-treasurer,* J. R. Karlovic, Standard Brake Shoe & Fdy. Co. *Directors:* Earl Kreunan, Memphis Casting Works, Inc.; W. Earl Pace, Memphis Pattern & Model Works; Edward Boywid, International Harvester Co., Memphis Works; Tom Bant, International Harvester Co., Memphis Works.

Mo-Kan

Chairman, Lloyd Canfield, Canfield Foundry Supplies & Equipment; *vice-chairman,* Henry C. Deterding, Soken Galamba Corp.; *secretary,* Howard Julian, Blue Valley Foundry; *treasurer,* H. P. Schwickrath, Prier Brass Mfg. Co.

Northeastern Ohio

Chairman, Dave Clark, Forest City Foundries Co.; *vice-chairman,* Lewis T. Crosby, Sterling Wheelbarrow Co.

Northern California

Chairman, John Bermingham, E. F. Houghton Co.; *vice-chairman,* Clayton D. Russell, Phoenix Iron Works; *secretary,* Davis Taylor, American Wheelabrator & Equip. Corp.; *treasurer,* Fred A. Mainzer, Pacific Brass Foundry of San Francisco. *Directors:* William Skinner, Pacific Graphite Co.; W. S. Gibbons, Ridge Foundry; Nino V. Davi, Pacific Steel Casting Co.; Harold E. Henderson, H. C. Macaulay Foundry Co.; Roy A. Hoag, General Metals Corp.; C. R. Tinsley, U. S. Pipe & Foundry Co.

N. Illinois & S. Wisconsin

Chairman, W. H. Shinn, Gunite Foundries Corp.; *vice-chairman,* Howard W. Miner, Fairbanks Morse & Co., Mfg. Div.; *secretary,* Richard A. Oster, Beloit Vocational & Adult School; *treasurer,* Lawrence G. Peterson, Sundstrand Machine Tool Co. *Directors:* Charles N. Deubner, Yates American Machine Co.; James Affinito, Mattison Machine Works.

Oregon

Chairman, Philip J. Laugen, Oregon Steel Foundry Co.; *vice-chairman,* Harry Czyzewski, Metallurgical Engineers, Inc.

Philadelphia

Chairman, Daniel E. Best, Bethlehem Steel Co.; *vice-chairman,* Charles W. Mooney, Jr., Link-Belt Co., Olney Fdy.; *secretary-treasurer,* W. B. Coleman, W. B. Coleman & Co. *Directors:* W. Donald Bryden, Philadelphia Bronze & Brass Corp.; W. S. Giele, Walter Giele Co.; L. Dill, Geo. F. Pettinos, Inc.; T. R. Walker, Jr., U. S. Pipe & Foundry Co.; Henry C. Winte, Florence Pipe Foundry & Machine Co.

Quad City

Chairman, William Ellison, Thiem Products, Inc.; *vice-chairman,* C. C. Fye, John Deere Harvester Works; *secretary-treasurer,* John G. Smillie, John Deere & Co.

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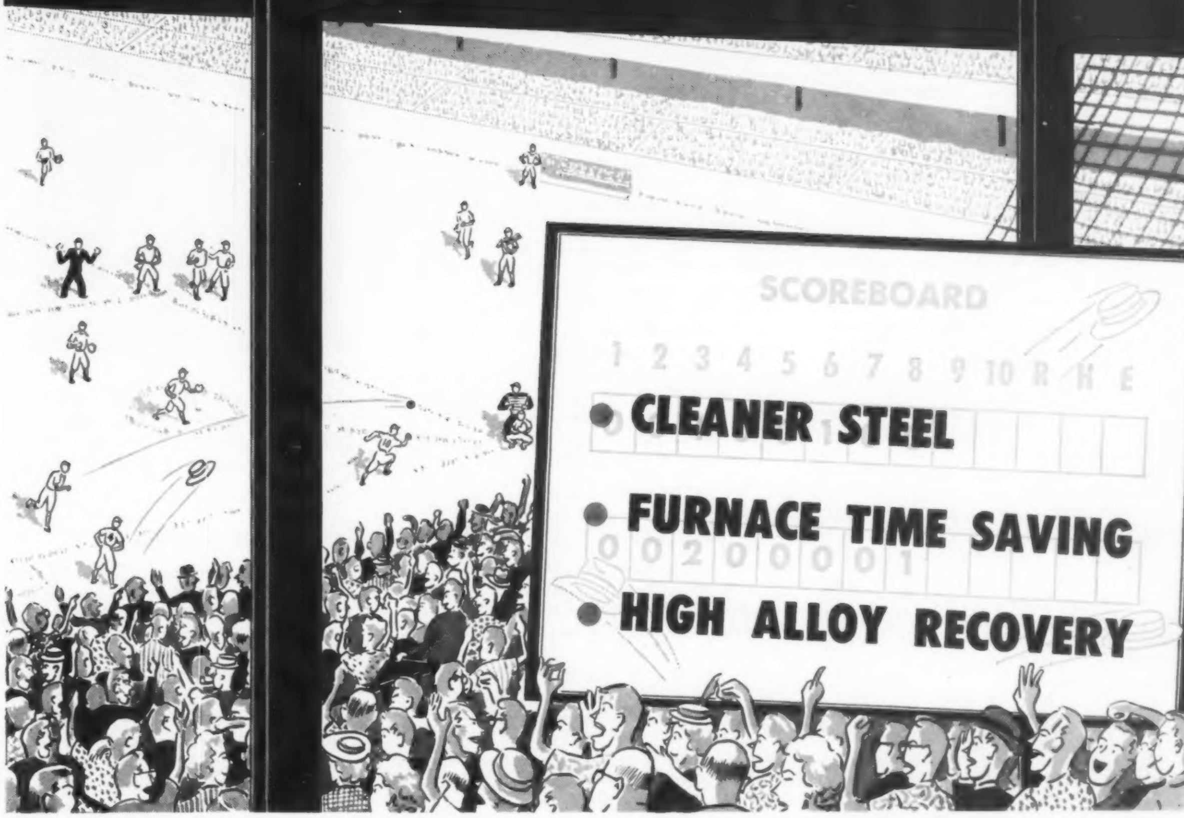
With SILICOMANGANESE . . .



. . . It's always a TRIPLE PLAY!

Silicomanganese is one of the most economical and efficient furnace blocks and deoxidizers. It produces cleaner steels with well distributed inclusions . . . assures good manganese recovery . . . and saves furnace time due to low melting point, low carbon content and fast solubility. An ideal manganese addition to the ladle.

Ohio Ferro Products

- FERRO - SILICON 25 - 50 - 65 - 75 - 85 - 90%
- SPECIAL BLOCKING 50% FERRO - SILICON
- SILICON METAL
- HIGH CARBON FERRO-CHROME
- LOW CARBON FERRO-CHROME SILICON
- FERRO - MANGANESE
- SILICO-MANGANESE
- BOROSIL
- SIMANAL
- RARE EARTH ALLOYS
- LOW CARBON FERROCHROME

Briquets

- SILICON
- MANGANESE
- SILICO-MANGANESE
- CHROME

PHILO · TACOMA · BRILLIANT
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Obituaries

Dr. Harry A. Schwartz died at his home in Cleveland Heights, Ohio. He was retired from active duty in research at National Malleable & Steel Castings Co., Cleveland, in 1953, but had continued as assistant to the vice-president as consultant.

Dr. Schwartz, 74, had received the John A. Penton Gold Medal of AFS, the E. J. Fox Gold Medal of the I.B.F., the Charles H. McCrea award of the Malleable Founders Society and a doctorate of engineering at Case Institute of Technology.

For more than a half century Dr. Schwartz was connected with the National Malleable & Steel Castings Co. He joined the company in 1902 at its Indianapolis plant. He served successively there as a draftsman, chemist, metallurgist and assistant superintendent.

In 1920 he came to Cleveland to establish a department of research, of which he was manager. In 1953 he retired from active duties with the company, but he continued in an advisory capacity as assistant to the vice-president in charge of production.

Dr. Schwartz was a graduate of Rose Polytechnic Institute at Terre Haute, Ind., in the class of 1901. He earned a master's degree in science there in 1903 and a degree of mechanical engineer in 1905. He was an instructor there in 1901-1902. For many years he had been a lecturer on special subjects at Case Institute of Technology.

Dr. H. A. Schwartz

Dr. Schwartz's professional associations include the American Foundrymen's Society, Sigma Xi, the British Iron & Steel Institute, the American Institute of Mining and Metallurgical Engineers, American Society for Testing Materials and the American Society for Metals.

"Foundry Science" and "American Malleable Cast Iron" are two of the many technical papers of which Dr. Schwartz was author.

He was chairman of the Committee on Specifications for Malleable Iron and AFS representative on A.S.T.M. Committee A-7 on Malleable Iron; Chairman of Committee on Recommended Practices for Malleable Foundries; member of Advisory Committee to AFS research project at Bureau of Standards. He has served on several other committees of AFS and has presided at some sessions of the AFS conventions.

Edward W. Beach, 80, Muskegon, Mich., died in June. He was awarded the AFS Honorary Life Membership in 1951 "for outstanding contributions to the Society and to the industry in foundry engineering."

Long prominent in the fields of foundry engineering and management, Mr. Beach is credited, among many notable contributions to foundry technology, with first applying automotive cylinder casting patterns to molding machine production.

A past National Director of AFS, Mr. Beach entered the foundry industry as an indentured apprentice in 1891 and, prior to his retirement in 1950, was successively, president of Manufacturers Foundry Co.; president of Ferro Machine & Foundry Co.; vice-president of Warren Foundry Co.; and served for some 25 years as an engineering executive of Campbell, Wyant & Cannon Foundry Co.

Mr. Beach was a Charter Member of the Western Michigan Chapter, and he had served on the AFS Plant and Plant Equipment Committee ever since it was first established. In 1951 he was presented an award by the Western Michigan Chapter in the form of a bronze plaque for personal help in the early growth of the Chapter, in making the local group the best in AFS. The bronze medal was made at the Hackley Manual Training School Foundry by Adrian Archambault and his boys. The manual Training School Foundry of Muskegon, Mich. was designed and installed by Mr. Beach and has been copied by other schools in the country as well as abroad.

E. A. Beach

He won a certificate of merit from the Photographic Society of America for his documentary film on Nantucket, Mass., "The Little Gray Lady of the Sea."

Regional Conferences Begin in October

The annual fall and winter series of regional foundry conferences begins in October, with five scheduled for that month, two in February, and one in March of 1955.

Of the eight regional meetings planned, seven will be sponsored by AFS chapters: Michigan, Northwest, Metals Casting, All-Canadian, Wisconsin, Southeastern, and California. The New England Regional will be staged by the New England Foundrymen's Association.

Michigan Regional . . Oct. 14-15. University of Michigan, Ann Arbor. Sponsored by Central Michigan, Western Michigan, Detroit, Saginaw Valley, Michigan State College, and University of Michigan AFS Chapters. General Chairman: Kenneth H. Priestley, president, Vassar Electrology Products, Inc., Vassar, Mich. Conference theme is expansion of the casting market and production of more, better, and lower-cost castings through applied engineering techniques. Sessions will cover a general review of the industry's immediate future, with specific reference to the automotive field; economy in risering practice; mold design and gating; and a mold production session.

Northwest Regional . . Oct. 15-16. Hotel Vancouver, Vancouver, B. C., Canada. Sponsored by Washington, Oregon, British Columbia, and University of Oregon Chapters of AFS. General Chairman: S. J. Hatchett, manager, Canada Metal Co., Ltd., Vancouver, B. C.

Metals Casting Conference . . Oct. 28-29. Purdue University, West Lafayette, Ind. Sponsored by Michiana and Central Indiana AFS Chapters. General Chairman: Vern S. Spears, district representative, American Wheelabrator & Equipment Corp., Mishawaka, Ind.

All-Canadian Regional . . Oct. 28-30. King Edward Hotel, Toronto, Ont., Canada. Sponsored by Eastern Canada and Ontario AFS Chapters. General Chairman: Alex Pirrie, plant manager, Standard Sanitary & Dominion Radiator, Ltd., Toronto, Ont. Conference theme is: "Foundrymen Forward with Canada," emphasizing tools available to decrease costs, increase quality. A "Cost and Quality Improvement School" will be held on two half-days. Other sessions will cover horizontal and vertical gating, pressure molding, and human relations as applied to the foundry industry.

New England Regional . . Oct. 29-30. Massachusetts Institute of Technology, Cambridge. Sponsored by New England Foundrymen's Association. General Chairman: Joseph B. Stazinski, General Electric Co., Everett, Mass.

Wisconsin Regional . . Feb. 10-11, 1955. Hotel Schroeder, Milwaukee. Sponsored by AFS Wisconsin and University of Wisconsin Chapters. General Chairman: Paul C. Fuerst, assistant foundry superintendent, Falk Corp., Milwaukee.

Southeastern Regional . . Feb. 17-18, 1955. Tutwiler Hotel, Birmingham, Ala. Sponsored by Birmingham, Tennessee, and University of Alabama AFS Chapters. Program Chairman: Albert J. Fruchtl, resident manager, U. S. Pipe & Foundry Co., Birmingham.

California Regional . . Mar. 26-27, 1955. Ambassador Hotel, Los Angeles. Sponsored by Northern California and Southern California AFS Chapters. General Chairman: Wm. C. Baud, plant superintendent, Mechanical Founders division, Food Machinery Co., Los Angeles.

Chapter News

continued from page 78

Saginaw Valley

Chairman, Woodrow W. Holden, Foundry Div., Eaton Mfg. Co.; *vice-chairman,* Fred P. Strieter, Die Casting Dept., Dow Chemical Co.; *secretary,* Alfred Hilgeman, General Foundry & Mfg. Co.; *treasurer,* F. A. Buike, Almont Mfg. Co. *Directors:* G. A. Rogers, Almont Foundry Co.; F. James McDonald, Central Foundry Div., General Motors Corp.; H. H. Miller, Buick Motors Div., General Motors Corp; L. A. Cline, Saginaw Foundries.

Tennessee

Chairman, Charles S. Chisolm, Wheland Co.; *vice-chairman,* William B. Greiser, Ross Meehan Foundries; *secretary-treasurer,* Hal Roach, Laclede Christy Co. *Directors:* W. P. Delaney, Sr., Eureka Foundry Co.; J. D. Cliett, Jr., Crane Co., Chattanooga Div.; Herman Bohr, Jr., Robbins & Bohr; John A. Lasater, Combustion Engineering, Inc.; C. R. Kellerman, Lodge Mfg. Co.

Texas

Chairman, Edward W. Wey, Dee Brass Foundry, *vice-chairman,* James R. Hewitt, Hewitt McGrail Co.; *secretary,* J. D. Magee, Southern Div., American Smelting & Refining Co.; *treasurer,* E. F. Laminack, Texas Steel Co. *Directors:* Elmore C. Brown, Whiting Corp., W. A. Bearden, M. A. Bell Co.; Harold Judson, Kincaid-Osburn Electric Steel Co.; J. M. Hollingsworth, Lone Star Steel Co.

Timberline

Chairman, E. Byron McPherson, Jr., McPherson Corp.; *vice-chairman,* William R. Manske, American Manganese Steel Div., American Brake Shoe; *secretary,* Alfred William Hall, Hathaway Instrument Co. *Directors:* Charles Gerbig, Denver Fire Clay Co.; Joseph F. Taleck, Colorado Pattern Co.

Tri-State

Chairman, D. W. McArthur, Oklahoma Steel Castings Co.; *vice-chairman,* Willis H. Mook, Bethlehem Supply Co.; *secretary,* R. F. Forsythe, Big Four Foundry Co.; *treasurer,* Edward W. O'Brien, Oklahoma Steel Castings Co. *Directors:* Philip V. Spooner, Missouri Steel Castings Co.; Leo Masching, Frank Wheatley Pump & Valve Mfg.

Western New York

Chairman, William H. Oliver, American Radiator & Standard Sanitary Corp.; *vice-chairman,* Leonard Greenfield, Samuel Greenfield Co.; *secretary,* Avitus J. Heysel, E. J. Woodison Co.; *treasurer,* Martin W. Pohlman, Pohlman Foundry Co., Inc. *Directors:* Gordon Oremus, Bignall Co.; Milton Emery, Buffalo Pipe & Foundry Corp.; George B. Michie, Electro Refractories & Abrasive Corp.

Wisconsin

Chairman, Robert V. Osborne, Lakeside Malleable Castings Co.; *vice-chairman,* P. C. Fuerst, Falk Corp.; *secretary,* D. R. Hutchison, Nash Div., American Motors Corp.; *treasurer,* Bradley H. Booth, Carpenter Bros., Inc. *Directors:* Albert F. Pfeiffer, Pattern & Foundry Div., Allis-Chalmers Mfg. Co.; Clarence A. Gehrman, Sterling Wheelbarrow Co.; George J. Gilson, J. E. Gilson Co.

Rochester

Chairman, Duncan M. Wilson, Engineered Castings Div., American Brake Shoe Co., *vice-chairman,* Donald E. Webster, American Laundry Machinery Co.; *secretary-treasurer,* Charles D. Loomis, General Railway Signal Co. *Directors:* Arthur B. Tinker, Papec Machinery Co.; G. Arthur Spindler, City Pattern Works; Herbert Senger, Ritter Co., Inc.

F.E.F. Publishes Year Book

Foundry Engineer, published quarterly by the Foundry Educational Foundation, is listed as the 1954 Year Book. Edition is a consolidation of reports and listings which, in past years, were sent as separate mailings. Included is a progress report of the F.E.F. and a statement of policies and practices.

Officers and trustees; past trustees; past presidents; committees, and membership directory are also incorporated in the year book.

lunch off a foundry floor?

Even with KIRK & BLUM Dust Control, you'd hardly expect to lunch off the floor in a busy foundry . . . but there is a vast difference between a "clean" and a "dirty" foundry. And not just in appearance! The "clean" foundry, with effective dust control, profits in reduced maintenance in higher employee morale, in better plant-community relations and in overall efficiency.

Because foundry dust control is "no picnic," put your problem up to experts. KIRK & BLUM, with more than 47 years of experience, does the complete job . . . design, fabrication and installation of efficient, dependable dust control.

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The Kirk & Blum Manufacturing Co.
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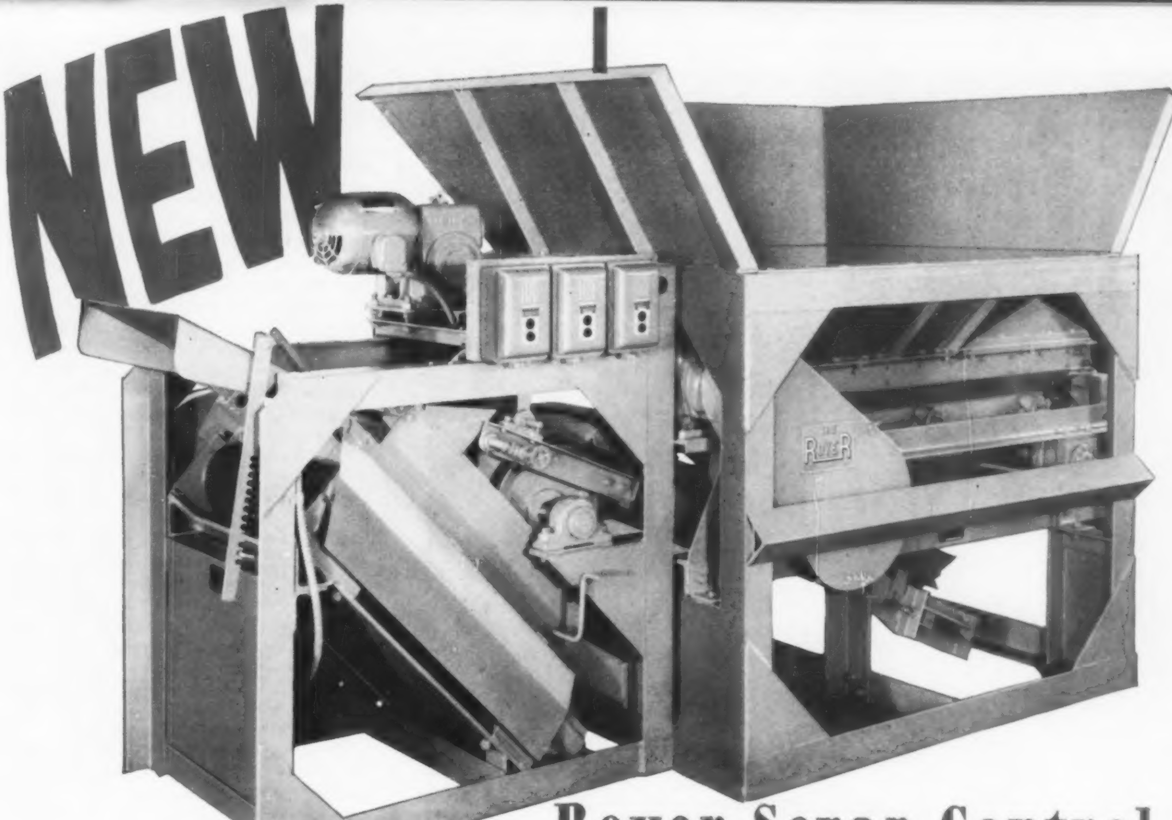


Royer Scrap Control

MODEL S-522-5MR

A *Complete* Sand Conditioning Unit

12% Scrap Loss Reduced to 3%. 44% Man Hour Reduction as a Southern foundry revamps its sand conditioning and installs a new Royer Scrap Control "S-522-5MR" for cleaning and conditioning all sand.

Second in the new Royer Scrap Control series, the "S-522-5MR" is a complete packaged sand cleaning and sand conditioning operation. Designed for floor level operation and front end bucket loader feeding, this unit can be moved from place to place by overhead crane, making it possible to set up the sand conditioning operation wherever needed. With a capacity of 60 tons per hour it can be utilized as a complete sand system, bringing the benefits of semi-mechanization to small and medium sized foundries.

Write for further details on this and other models of the new Scrap Control series.

PROBLEMS:

1. High cost of manually charging sand conditioning equipment
2. Damage to sand conditioning and pattern equipment by tramp iron in the sand
3. A 12% scrap loss

SOLUTION:

Installation of a Model "S-522-5MR" Royer Scrap Control enabled sand to be handled by front end bucket loader, cleaned by shake-out grids and permanent magnet, tempered automatically, mixed, fluffed, cooled and aerated by a Royer Sand Separator and Blender.

RESULTS:

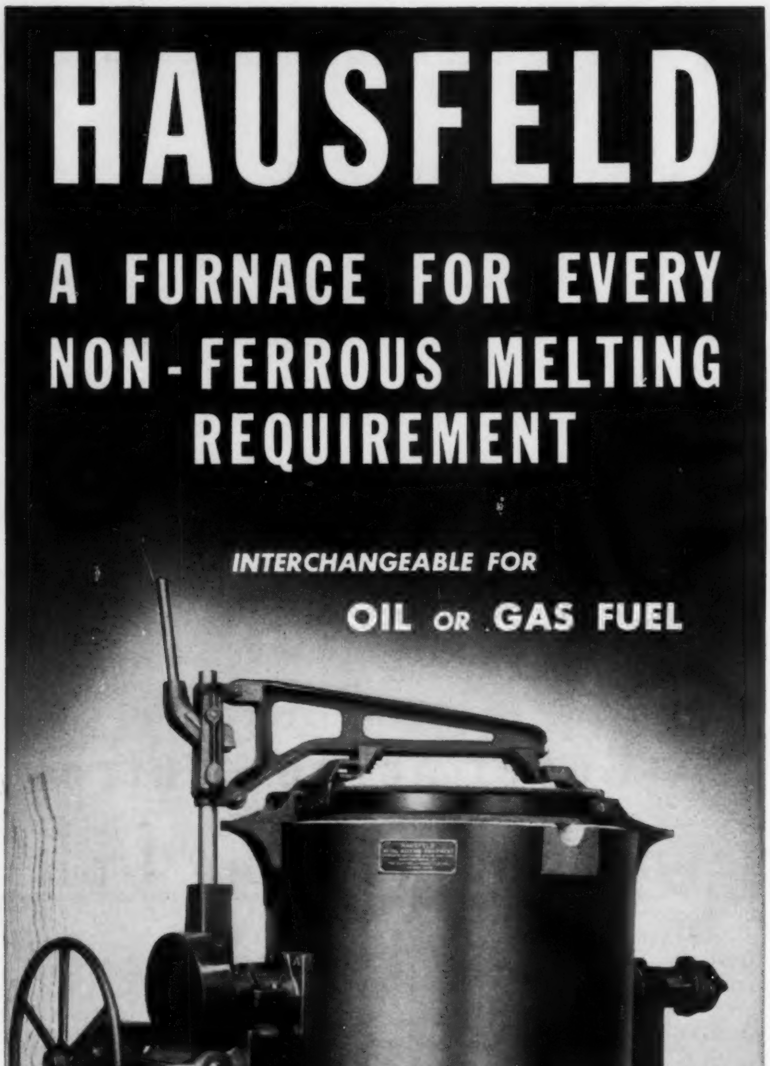
1. 44% of night crew released for other work
2. Equipment and pattern damage eliminated
3. Clean sand uniformly tempered
4. 12% scrap loss reduced to 3%, of which 75% can be salvaged

Export Department, 306 W. Washington Blvd. Chicago 6, Ill., U.S.A. Cable: ASMAN

ROYER

Foremost in Sand Conditioning Equipment

ROYER FOUNDRY & MACHINE CO. 155 PRINGLE ST. KINGSTON, PA.



Book Reviews

continued from page 72

Materials and Processes . . by James F. Young. 1074 pp. 489 fig., 77 tables. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York. $8.50 (Second edition, revised 1954).

Expanded 50 per cent, the new edition of this book brings the reader up-to-date information on materials, metallic and non-metallic, and on the industrial processes used in working the materials. Each chapter is complete with numerous references and review questions, making the book valuable for instruction as well as for reference. Most chapters have been completely rewritten.

Chapter headings in Part 1, Materials, are: nature of pure metals, alloys, metallographic examination, mechanical properties of metals, corrosion and tarnishing properties of metals, electrical and magnetic properties of metals, iron and steel, non-ferrous metals and alloys, non-metallic materials, electrical insulation, plastics, rubber, ceramics, and miscellaneous non-metallic materials.

Processes, Part 2 of the book, covers the following topics: casting, powder metallurgy, heat treating, hot-working, cold working, welding and allied processes, machining, cleaning, plating, and organic finishing of metals, gaging, inspection, and non-destructive testing, and statistical methods useful in industrial quality control.

Color Film of Albion

Albion Malleable Iron Co., Albion, Mich., has available a 16 mm sound color film showing its foundry in action. Film shows cores made and set in place, molds made and poured, and castings cleaned and finished. Special emphasis has been given to the newest development in molding techniques. Complete operation of mold blowing machines is one of the highlights of the picture.

Entitled "Malleable Metals," running time is 13 minutes. Film is available for showing and may be secured from James W. Hallock, Sales Manager, Albion Malleable Iron Co., Albion, Mich. No charge is involved.

Brass and Bronze Bulletin Available

Bulletin, "Melting of Brass and Bronze" (T. I. S. Report No. 32), contains information on layout of melting facilities; furnaces; other equipment details; melting procedures, and fluxes deoxidizers and degasers.

Copies may be obtained free by writing U. S. Department of Commerce, Business and Defense Services Administration, Office of Technical Services, Washington, 25, D. C.

California Gray Iron Founders Hold Meeting

Attending the regional meeting of the California Gray Iron Founders' Society are left to right: Gordon Martin, Atlas Foundry & Mfg. Co.; A. S. Sanchez, Vulcan Foundry Co.; Don Workman, Executive Vice-President, G.I.F.S.; Al Renfrow, Renfrow Foundry; H. J. Trenkamp, Ohio Foundry Co., G.I.F.S. President; Earl Paltenghi, H. C. Macauley Foundry Co.; and C. Gregg, Gregg Iron Works.

Over 70 northern and southern California gray iron foundry executives attended a regional meeting at the La Playa Hotel, Carmel, Calif., June 11-13.

Gordon Martin, Atlas Foundry & Mfg. Co., served as General Chairman, representing the hosts, the Northern California Management Group of G.I.F.S. Guests attending were H. J. Trenkamp, G.I.F.S. president; Don Workman, G.I.F.S. executive vice-president; and Roy Paulsen, G.I.F.S. regional coast group consultant.

After introductions, the foundrymen concentrated on a discussion and review of current foundry management problems. Included was a review of operating statistics, air pollution, foundry costs, and a review of the current G.I.F.S. program evaluation activities.

In his remarks, Henry J. Trenkamp, spoke briefly on national problems now confronting the industry, including the need for constant preparedness for future national emergencies. He emphasized the importance of maintaining a pool of foundry executives qualified for service in various Government agencies when and as required.

Steel Founders' Society Announces Fall Meeting

Steel Founders' Society of America has announced its 52nd Fall Meeting to be held at The Greenbrier, White Sulpher Springs, W. Va., September 27-28. Program for the meeting is as follows:

MONDAY, SEPTEMBER 27

8:30 am . . REGISTRATION

9:30 am . . FIRST GENERAL SESSION. Call to order and Opening remarks—A. J. McDonald, president, S.F.S.A., and vice-president, American Steel Foundries, Washington, D. C.

11:15 am . . *Failures in Metals,* Everett Chapman, Consulting Engineer, West Chester, Pa.

11:45 am . . REMARKS BY COUNSEL, Chauncy Belknap.

12:00 m . . LUNCHEON

12:45 pm . . MEN'S GOLF TOURNAMENT

2:00 pm . . LADIES' CARD PARTY

7:00 pm . . SOCIAL HOUR—Ladies Invited

8:00 pm . . INDUSTRIAL BANQUET—Ladies Invited

10:30 pm . . SOCIAL HOUR AND DANCING

TUESDAY, SEPTEMBER 28

9:30 am . . REGISTRATION

10:00 am . . SECOND GENERAL SESSION. *Appraisal of the Business Scene,* Dr. Martin Gainsbrugh, National Industrial Conference Board, New York City.

10:45 am . . REPORT - PROGRAM APPRAISAL COMMITTEE, Chairman C. L. Harrell, Sterling Steel Casting Co., East St. Louis, Ill.; A. M. Andorn, Penn Steel Castings Co., Chester, Pa.; C. H. Pomeroy, National Malleable and Steel Castings Co., Cleveland, Ohio.

11:30 am . . PRESENTATION. S.F.S.A. Annual Safety Awards.

12:00 pm . . ADJOURNMENT

12:15 pm . . COCKTAIL PARTY—Ladies invited.

1:00 pm . . INDUSTRY LUNCHEON—Ladies invited.

National Foundry Assn. to Meet in October

National Foundry Association will hold its 56th Annual Meeting at the LaSalle Hotel, Chicago, October 7-8. President Summerfield Brunk, Headford Brothers and Hitchins Foundry Co., Waterloo, Iowa, will open the meeting Thursday, October 7 with a report on the Association's activities and accomplishments during the past year. He will be followed by J. P. Goedert, Chairman of the Subcommittee on Long-Range Planning of the American Institute of Accountants, who will outline the effect of the 1954 Tax Reform Bill on the foundry industry.

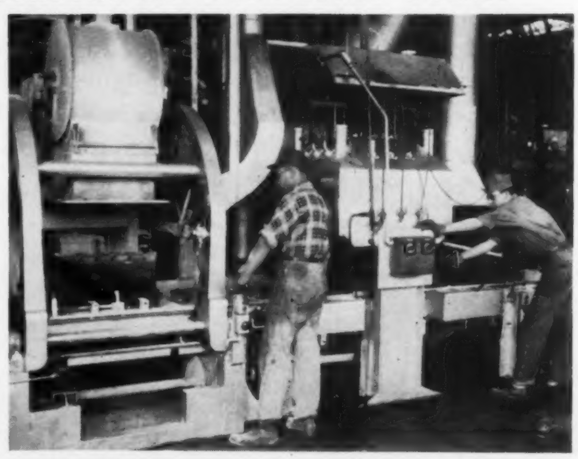
Dr. Leo Wolman, Director, National Bureau of Economic Research, will speak on Thursday afternoon. Phil Carroll, Industrial Engineering Consultant, will follow Dr. Wolman with a discussion of "Time Study and Incentive Clauses in Labor Agreements."

Open Contour Mold Department in Harvester Plant

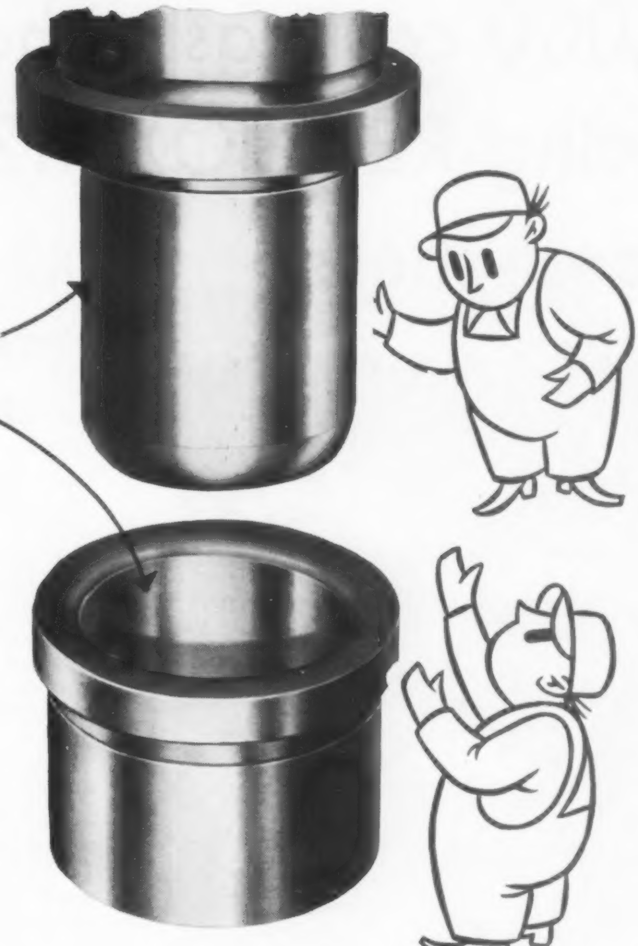
Investigations started in 1949 in the Manufacturing Research Department of International Harvester Co., Chicago, have led to pilot plant and finally production scale shell molding operations in the company's Indianapolis Works foundry. Known as Contour (trademark registered U. S. Patent Office) molding, the process is being used on truck engine castings which can be produced with little or none of the machining formerly required. Parts include two exhaust seal rings, two exhaust pipe flanges, and a flywheel.

The machine used on the smaller parts has an automatic conveyor that moves up to eight patterns through the cycle in a closed rectangular path to produce a mold every 45 seconds. Standard size patterns 20 x 24 in. are preheated in two stages, (infrared oven and gas oven), and coated in an automatic rollover machine. Curing is done in a hood-type radiant gas oven by raising the pattern into position under the hood. Shells are stripped by an air push-off type machine. Cycle in the flywheel machine is 90 seconds per mold.

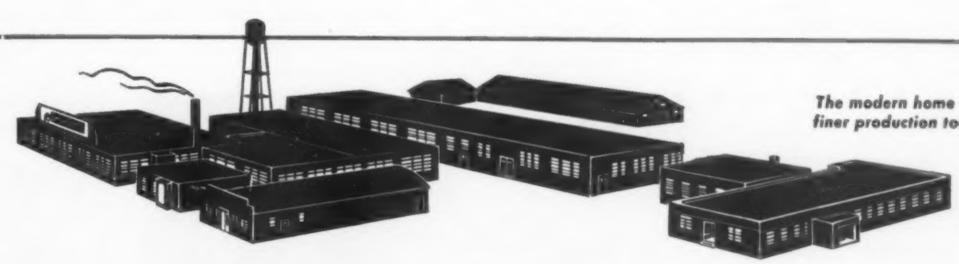
Molds are sealed with a polyvinyl resin paste that sets while the mold is held in an air-squeeze press. Conventional molding sand is used to back the shells, the sand being packed by jolting while the shells (six to a mold) are positioned over a common runner pattern. Molds are poured in a conventional conveyor and go through the same shakeout, cooling, and cleaning procedures as green sand casting.



carburized and hardened steel wearing surfaces and ductile cores mean long life for UNIVERSAL flask pins and bushings



It's no easy trick to produce flask pins and bushings that are hard enough to take long, rigorous wear, and yet have cores ductile enough to resist breakage and rough treatment in the foundry. However, Universal has accomplished this difficult task. Universal flask bushings are double quenched and double drawn to produce a fine grain structure that will withstand considerable stress and strain without breaking or chipping. The wearing surfaces are carburized and hardened to reduce wear and prolong the life of both pin and bushing. Universal flask pins and bushings are precision ground to extremely close tolerances to insure instant, accurate alignment of cope and drag. Plain, taper and threaded series pins and bushings are available in a complete range of sizes as regular stock items. For complete information about Universal flask pins and bushings, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. —or the home office.



The modern home of finer production tools

172

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 12, MICHIGAN

500,000 castings without a reject by using RESINOX 1128 bonded shells

That's the record of Midwest Foundry Co., Coldwater, Michigan

Gray iron is poured into 34 molds from one ladle as they pass on a conveyer belt. Permeable sand-Resinox 1128 shell molds permit gases to escape, eliminate many metallurgical defects such as blowholes, porosity and cold shuts.

Half a million items, cast to a tolerance of .010" without a single reject . . . labor costs reduced more than half . . . 12 pounds of finished product for every 15 pounds of metal poured . . . elimination of machining on intricate designs . . . 20% lighter molds, on the average... up to 4 times more production per man hour—these shell molding advantages reported by Midwest Foundry Company are typical of those experienced by foundries throughout the country.

"We are producing a cylinder liner with thin vertical walls demanding very close tolerances, by shell molding with Monsanto Resinox 1128," reports Mr. Albert H. Doerr, Chief Engineer. "The high flow characteristics of Resinox 1128 combined with the integral core features of shell molding give us high quality finish, clean stripping and closer dimensional tolerances than with any other combination... and we are getting these results with an exceptionally low 5% resin-to-sand ratio."

The success of the shell molding process is heavily dependent on the quality of the resins used. That's why more and more foundries are specifying Monsanto *Resinox* shell molding resins to get consistently better castings at lower cost. You'll find that research-proved and shop-tested Monsanto foundry resins will meet your most exacting production requirements.

For complete information on Resinox shell molding resins, phenolic and Resimene urea resins for core binding, and Lytron sand conditioner for conventional sand casting, mail the convenient coupon today. Resinox: Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY, Plastics Division, Room 5608, Springfield 2, Mass.
Please send me complete information on:
☐ Resinox shell molding resins; ☐ Monsanto phenolic resins; ☐ Monsanto core binding resins; ☐ Lytron sand conditioner.

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MONSANTO

SERVING INDUSTRY...WHICH SERVES MANKIND

Who Says You Can't Weld Malleable?

THE standard misconception that malleable iron can't be welded evidently isn't shared by the agricultural implement company that produces this housing for the safety release mechanism on a power mowing machine drawbar. Some eight years and 15,000 units ago, the company started making the part by drilling and tapping the malleable casting, inserting the 2-in. square steel tubing, and welding with an AWS Class E-6016 rod. According to Don Fulton, a sales engineer for Northern Malleable Iron Co., St. Paul, Minn., which supplies the castings, the implement manufacturer doesn't know of a single failure. Fulton spotted the job in a Northern Malleable customer's plant and obtained details for George T. Boli, company president.

More than 15,000 of these power mowing machine drawbar housings, combining malleable iron and wrought steel, have been successfully welded during past eight years.

Abstracts

Abstracts below have been prepared by Research Information Service of The John Crerar Library, 86 East Randolph Street, Chicago 1, Ill. For photoduplication of any of the complete articles briefed below, write to Photoduplication Service at the above address, identifying articles fully, and enclosing check for prepayment. Each article of ten pages or fraction thereof is $1.40, including postage, Articles over ten pages are an additional $1.40 for each ten pages. A substantial saving is offered by purchase of coupons in advance. For a brochure describing Crerar's library research service, write to Research Information Service.

A506 . . "Designing and Operating a Heat Treating Department," R. W. Wilson, *American Foundryman,* vol. 25, no. 5, May, 1954, pp. 102-106. Design of a modern heat treating installation for handling the annealing of low alloy cast gears, hardening and tempering of carbon and low alloy steel castings, and stress relieving of certain types of gray iron castings.

A507 . . "Producing Titanium Alloy Castings," Marvin Glassenberg and M. J. Berger, *American Foundryman,* vol. 25, no. 5, May, 1954, pp. 107-112. Description of a furnace for studying casting characteristics of titanium. Graphite crucible used because of slow rate of dissolving in titanium. Also includes report on titanium casting techniques, using zircon shell molds coated with heavy layer of graphite wash.

A508 . . "Gating and Risering of Magnesium Alloys—Part 2," H. E. Elliott, *American Foundryman,* vol. 25, no. 5, May, 1954, pp. 113-122. Conclusion of article on risering and feeding fundamentals for magnesium alloys. Part 1 in April, 1954 issue.

A509 . . "Pre-Mixing of Reconditioning Materials for Molding Sand," Burdette Jones, *American Foundryman,* vol. 25, no. 5, May, 1954, pp. 123-126. Pre-mixing of sand additives has resulted in definite savings in materials, better control of sand properties, and a cleaner sand conditioning department. Savings in materials alone more than pay for cost of pre-mixing.

A510 . . "Cupola Melting of Cast Iron Borings and Steel Turnings," W. Y. Buchanan, *American Foundryman,* vol. 25, no. 5, May, 1954, pp. 127-137. Process economizes in transport of material, reduces contamination through use of borings of known composition, cuts costs, conserves foundry materials.

A511 . . "After Three Years: Developments in Shell Molding," E. I. Valyi, *American Foundryman,* vol. 25, no. 5, May, 1954, pp. 138-143. Discussion of progress in materials, equipment, and the shell process as a whole.

A512 . . "Automatic Mold Stacking," G. Minogue, *American Foundryman,* vol. 25, no. 5, May, 1954, pp. 144-146. Mechanized foundry designs automatically synchronized mold cheek stackers for use with fully-automatic blow squeeze machines for stack molding.

A513 . . "Conforming Specifications for Copper-Base Alloy Castings," (Foundry Facts), *American Foundryman,* vol. 25, no. 5, May, 1954, pp. 147-148. Tables to be used as guides for conforming specifications for copper-base casting alloys, with cross-reference to various organizational codes.

A514 . . "Introduction to Noise," J. O. Kraehenbuehl, *American Foundryman,* vol. 25, no. 6, June, 1954, pp. 52-58. An authoritative study of noise in industry, its effect on worker efficiency, and methods of control.

A515 . . "Development of a West Coast Steel Jobbing Foundry," H. F. Scobie, *American Foundryman,* vol. 25, no. 6, June, 1954, pp. 59-63. A medium-size, steel jobbing foundry in the Northwest becomes a paying operation in two years.

Continued on page 92

Quiz Answers

continued from page 62

HERE are the answers to the Quizmaster questions on permanent molding on page 62:

1. (c) While some gases are absorbed by the coating, the main function of a coating of this kind is to keep the metal hot and fluid so that it will properly fill out the mold.
2. (a)
3. (a) although (c) is often important.
4. (a) and (b) to keep the metal temperature up as it flows into the mold. Thin sections of the cavity may have to be heavily coated for the same reason: to get proper filling out.
5. (c) On a new mold, this often happens also because the surface lacks "tooth" to bond the coating. A light sand blasting before applying the coating helps. In any case, complete degreasing is a "must."
6. (a) This may be after a few hours or after several days, depending on the coating used, how carefully applied, whether a lubricating coating has been sprayed over it, and also upon the type of casting.
7. (b) generally, although too heavy a coating applied while the mold is relatively cool may cause the trouble to develop when the mold gets hot.
8. (c)
9. (b) if not too bad.
10. (b) although, if the coating is not dry, large holes will be found in the casting and the finish will be even worse than just rough.
11. (c)
12. (b) and, in many cases, (c)
13. (b) and (c)
14. (a)
15. (b)
16. (b) or (c). (b) is much faster but must be carefully handled. Lubricating coatings can often be removed with a wet cloth or brush.

Committees

continued from page 76

viewed work still in progress or contemplated at the Department of Mines, including examination of effects on tensile properties of centrifuged castings of impurities, boron for grain refinement, and thermal gradients. Although the work might constitute the basis for a paper, the committee made no plans to guide the work.

It was reported in discussion that interest in centrifugal and centrifuged castings seems to be increasing, referring to use of these processes for production of electric motor rotors, aircraft frames, and a variety of rings for forging stock, searchlight assemblies, and of 750 bearing alloy.

Abstracts

continued from page 90

A516 . . "Investment Precision Casting Without Expandable Patterns," A. Dunlop, *American Foundryman,* vol. 25, no. 6, June, 1954, pp. 64-69. Refractory molds are poured over patterns as a slurry which gels to rubbery consistency ready for ignition. Flexibility of mold in gel stage makes possible use of one-piece patterns with back draft. Surface details and precision are of high order.

A517 . . "High Temperature Melting and Pouring of Gray Iron," Koichino Kagami, *Fonderia,* vol. 2, no. 11, November 1953, pp. 457-460 (in Italian). Whereas in the United States the founding of cast iron takes place at temperatures exceeding 1500 C, in Japan these operations are performed at about 1400 C. Since the use of higher temperatures involves economic burdens, the author wanted to determine the advantages that may justify such additional expenses. By testing the materials obtained at different temperatures he found that, while the somewhat greater hardness of the product obtained at the higher temperature is only indirectly attributable to the latter, its lower porosity and higher resistance to the hydraulic test are certainly produced by the higher temperature of the operations.

A518 . . "Induction Melting with High and Low Frequency," Frank T. Chesnut, *American Foundryman,* vol. 25, no. 6, June, 1954, pp. 70-74. Author reviews advantages of induction melting process, with reference to particular applications for low and high frequency furnace types. Regulations of Federal Communications Commission controlling this equipment are explained. Paper was presented at January, 1954 meeting of Industrial Electrification Council.

A519 . . "Olivine-Silica Molding Sands," William A. Snyder and Gilbert S. Schaller, *American Foundryman,* vol. 25, no. 6, June, 1954, pp. 75-81. Properties of silica-based synthetic sands were controlled through use of olivine flour. Although fusion point was lowered, black scale formation decreased, indicating reduction in cleaning costs for large castings made with olivine flour. Sands with olivine flour also showed less sensitivity to moisture variations than those with silica flour. Evidence seems insufficient for firm conclusions, however, at this time.

A520 . . "Experiences with Plastics in Pattern-making Practice," Wm. C. H. Dunn, *American Foundryman,* vol. 25, no. 6, June, 1954, pp. 82-83. Brief review of techniques involved in use of plastics for making patterns and core boxes, and for coating wood patterns to achieve wear resistance.

CASTING through the Ages

Chapter Meetings

September

10 . . Central New York
Trinkaus Manor, Oriskany, N. Y. Technical meeting. Howard Wilder, Vanadium Corp. of America, "Cupola Operation."

13 . . Cincinnati
The Cincinnati Club, Cincinnati. Clyde A. Sanders, American Colloid Co., "Have You Seen These Defects Before?"

13 . . Northern California
Shattuck Hotel, Berkeley, Calif. Clifford E. Wenninger, National Engineering Co., "Selection and Preparation of Synthetic Foundry Sands."

15 . . Central Michigan
Hart Hotel, Battle Creek, Mich. AFS Technical Director Hans J. Heine, "The Foundryman's Most Unused Tool."

17 . . Texas
Houston, Texas. L. D. Richardson, Eutectic Welding Alloys Corp., "New Developments in Foundry Welding."

20 . . Quad City
Panel session: *Molding Methods, Gating and Pouring.*

21 . . Twin City
Covered Wagon, Minneapolis. James D. Holtzapple, Continental Foundry & Machine Co., "Safety in the Foundry."

October

8 . . Northern California
Sequoia Country Club, Oakland, Calif. Annual Northern California Foundrymen's Golf Tournament.

15 . . Central New York
Mark Twain Hotel, Elmira, N. Y. Technical Session. Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., "High Pressure Molding."

15 . . Texas
San Antonio, Texas. Guest speaker, Charles K. Donoho, American Cast Iron Pipe Co. Color film, "Production of Centrifugally Cast Steel Tubes."

AFS Headquarters Seeks Old Transactions

The national headquarters of American Foundrymen's Society has an urgent need for used volumes of the official society *Transactions.*

The years specifically sought are 1935-1952, inclusive, through Volume 60. Books must be in good condition, and will be purchased at $2.50 each.

The demand for back issues of *Transactions* results from the constantly increasing membership of the society. Copies should be mailed to Book Section, American Foundrymen's Society, 616 So. Michigan Ave., Chicago 5, Illinois.

Abrasion-Resistant Alloy

New, extremely hard, abrasion-resistant iron alloy—Tisco 150-Y—is announced by Taylor-Wharton Iron and Steel Co., High Bridge, N. J. Alloy was developed to combat abrasion in its severest forms and can be heat treated to 700 Brinell.

Incorporates Australian Journal

Foundry and Metal Treating Journal, Vol. 1, No. 1, April 1954 issue, is the first issue incorporating The Australian Foundry Trade Journal. New publication has, for its objective, the presentation of up-to-date foundry and metal treatment information and service.

Short Course Program

Society of Industrial Packaging and Materials Handling Engineers and the University of Illinois, co-sponsors of the Packaging and Materials Handling Short Course, have just released the 1954 Educational Program. Course will be presented in Chicago, September 27-30, as part of the three-feature event that will highlight activities scheduled for the annual national meeting of the Society.

Shell Molding Film

New 25-minute sound slidefilm "Shell Molding and You," was designed to acquaint foundrymen and buyers of foundry products with the latest benefits of this new casting process, has been announced available for showings by General Electric Company's Chemical Materials Department.

Film describes the advantages of shell molding, affording a step-by-step demonstration of shell molding operations at G. E.'s new experimental foundry in Pittsfield, Mass. Included is a brief, interesting history of metal casting in cartoon form, showing how shell molding fits into the evolution of metal casting technique.

Film may be borrowed for showings by writing General Electric Co., Chemical Materials Dept., Pittsfield, Mass.

CONTENTMENT

Rich dudes who get financial breaks
Can gorge themselves with ham and steaks,
Rich sauce and butter without question—
And catch their death of indigestion.
But I, in humble straits, still spread
White oleo upon my bread
And make a meal of navy beans
And buttermilk and turnip greens.
We find ourselves well nourished
If we control our greed.
And folks who'll eat the plainer fare
Have all the food they need.
Some would dress in checkered suits
And Stetson hats and shiny boots,
And try to outshine all their pals
And make impressions on the gals.
But guys like me wear denim jeans
And old plug hats upon their beans,
No fancy duds, no pin or feather
My clothes protect me from the weather.
"Clothes make the man," the old sage says,
"And give that added touch."
A man can wear the clothes he wants
Who doesn't want too much.
Some in shiny cars would ride
With smart upholstery inside
With fancy gadgets, springs and wires,
Chrome and paint and white walled tires,
But I would rather risk my neck
In some dilapidated wreck
And think I'm getting quite a break
To own a car of any make.
Let others have their fluid drive,
Their automatic clutch.
A man can own the car he wants
Who doesn't want too much.
Some would dwell in marble halls
With velvet drapes and panelled walls,
With costly hardware on the doors
And deep pile rugs on hardwood floors.
But let me have a two room shack
Somewhere beside the U. P. track;
I'll thank the gods on bended knee
If that abode belongs to me.
Let others have pretentious mansions
Riches, pomp and such.
A man can have just what he wants
Who doesn't want too much.
Some would walk big business lanes
And earn their living with their brains
Manipulating bonds and stocks
And keeping business off the rocks.
I'll leave that calling up to you
(The headaches and the ulcers, too)
And hope you'll be a big, big shot—
I'm satisfied with what I've got.
Contentment isn't measured
By fame, position, wealth.
But search, and you will find it
Lying deep within yourself.
It's not achieved with mansions, or
Smooth cars with cushioned tires.
A man who doesn't want too much
Has all that he desires.—*Bill Walkins.*

Advertisers and their Agencies

This index is published as a convenience to the readers. While every care is taken to make it accurate AMERICAN FOUNDRYMAN assumes no responsibility for errors or omissions.

Classified Advertising

For Sale, Help Wanted, Personals, Engineering Service, etc., set solid..20c per word, 30 words ($6.00) minimum, prepaid. **Positions Wanted** ..10c per word, 30 words ($3.00) minimum, prepaid. Box number, care of *American Foundryman,* counts as 10 additional words.

Display Classified..Based on per-column width, per inch..1-time, $15.00; 3-time, $13.50 per insertion; 6-time, $12.50 per insertion; 12-time, $12.00 per insertion; prepaid.

HELP WANTED

SALES REPRESENTATIVES WANTED. Aluminum Permanent Mold foundry wants qualified casting salesman. Commission basis. Prefer man with established customer relations. **Write Box B42, AMERICAN FOUNDRYMAN, 616 South Michigan Ave., Chicago 5, Ill.**

FOUNDRY SUPERINTENDENT. For progressive semi-mechanized foundry in Indiana. Pouring 40 to 45 tons per day. Gray iron. Squeezer and cope and drag work. Casting weight 8 lbs. to 300 lbs. Man must be capable of controlling scrap and improving quality. Age required 35 to 45 years. Excellent opportunity for right man. **Box B44, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

FOUNDRY GENERAL MANAGER. For foundry located in central Illinois. Must be capable of supervising overall operations in foundry which has a capacity of 80 tons per day. Completely mechanized. Squeezer, cope and drag, and sand slinger. Casting range from 10 lbs. to 400 lbs. Age required 35 to 45 years. **Box B45, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

FOUNDRY FOREMAN to take charge of jolt roll-over machine production in well equipped Northwestern Pennsylvania gray iron foundry. Work is of semi-production and jobbing nature. Require an experienced man under 40 years to handle approximately 25 men. Write details of personal and practical background and salary expected. Address **Box B50, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

PLANT ENGINEER

Must have experience in steel foundry to take charge of both construction and all maintenance. In replying give complete information which will be held in strict confidence by a single executive.

Box B43

AMERICAN FOUNDRYMAN

616 S. Michigan Ave.

Chicago 5, Ill.

PRODUCTION MANAGER. Modern, medium-sized steel jobbing foundry requires experienced Production Manager to take charge of production department. Must be experienced in production scheduling, follow-up and customer relations. The right man can look forward to a permanent career with a progressive, expanding organization in the Metropolitan New York area. **Box B46, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

METALLURGIST

For key job modern iron and steel production foundry.

Must have production and research experience. Able to direct foundry metal-control operations and research.

Age: Under 40

Exceptional opportunity for aggressive, experienced metallurgist.

Apply **Box B49, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.,** giving particulars including education, age, experience, references, how soon available, and salary expected.

SALES REPRESENTATIVE, to sell foundry facings, supplies and refractories. Foundry experience necessary, sales experience helpful. Travel Eastern Pennsylvania, Western New York, Northern Maryland, should be centrally located in territory. Write giving full particulars, including age, draft status, compensation expected, etc. **Box B48, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

SALES ENGINEER. Real opportunity working for malleable foundry in Michigan. Must be willing to spend 50% of time traveling. Foundry background necessary requisite. In reply state age, résumé of experience, education and salary desired. **Address Box B51 AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

EQUIPMENT FOR SALE

FURNACES FOR SALE

10 used Heat Treating Furnaces, and two 7-ton gantry cranes, good condition, priced to sell.

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Boise, Idaho

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2 cylindrical shells, Model LFY
1 complete lining for LFY shell
also
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Eastern Foundry Supplies, Inc.
109 Frelinghuysen Ave.
Newark, N. J.

VICKERS CENTRIFUGAL CASTING MACHINE. 2 spinners, 10 hp hydraulic unit control, 250 - 2800 rpm. Complete $1,000. **A A Tool Supply Co., 1210 Webster Ave., Chicago, Ill. Phone: BIttersweet 8-9383.**

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EARL E. WOODLIFF,
Foundry Sand Engineer.
Consulting . . . Testing.
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Res. Phone Vermont 5-8724

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CANADIAN GRAY IRON FOUNDRY AVAILABLE. Modern, fully equipped Canadian foundry located in the heart of industrial Ontario wishes to associate with an American company desirous of manufacturing in Canada; or alternatively we wish to acquire manufacturing rights in Canada for one or more of your products. There are great possibilities in this association for a company able to provide some scientific and technical assistance. **Apply to Box B47, AMERICAN FOUNDRYMAN, 616 South Michigan Avenue, Chicago 5, Ill.**

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